# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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## EDITORIAL NOTES.

### Institution Honour for Mr. Newbigging.

THE communication received from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn), indicating the nature of some of the principal matters that were before the Council at their meeting last Wednesday, is strikingly interesting. It supplies information regarding the annual meeting in June, as to the progress of arrangements for the celebration of the Jubilee Year (1913) of the Institution, and respecting certain important questions that are under consideration by the Parliamentary Committee. Concerning the first two matters, we may reverse their order of precedence in relation to time, because the Council have resolved upon a graceful act, in connection with the Jubilee Year, that will stir in the hearts of the gas fraternity not only in the British Isles, but wherever the industry has penetrated, those feelings that come to one governed by ordinary human emotions when public, or (as in this case) semi-public, honour is done to one to whom honour is due to a distinguished degree. It is a too hackneyed form of expression to say that the name of Thomas Newbigging is a "household" one wherever the industry of gas supply obtains. The name stands for all having any technical or managerial association with the gas industry as something more than that. The name stands to all such, to each individual, as that of a revered guide, philosopher, and friend through many long years. The Council have determined to present to the *doyen* of British gas experts (whose consent to the necessary sittings has been given) his portrait in oils, "in recognition of his long and honourable connection with "the Institution, from its formation as the British Associa- "tion of Gas Managers, and the many services which he "has rendered to the industry."

Mr. Newbigging's association with the Institution dates from 1864; and that of the President for the Jubilee Year (Mr. Corbet Woodall) from 1865. This fact is interesting; and, all being well, there will be no one better able than Mr. Woodall in that Jubilee Year to look back, and speak with intimate personal knowledge of the early devotion of Mr. Newbigging to the interests of the gas industry. The doings of fifty years or so ago to many of us in the industry are only known as matters of recorded history; to Mr. Newbigging and Mr. Woodall the work of the period is a matter with which they were in personal touch, and in which they had lot and part. But we all know by individual knowledge, supplemented by the records, that the honour it is proposed to confer upon Mr. Newbigging in these days of his partial retirement (in which his interest in the affairs of the industry to which he devoted himself is as keen as ever) is one that will convey more in the act than in the material value of the gift. The regard—the term ill-suffices—the reverence (let us say in substitution) in which Mr. Newbigging is held, the debt of gratitude, the appreciation, will all be concentrated in that act, which will crown by the gas profession a career in which initiative, independent thought, conscientious work, participation in the struggles of the gas industry for rights and facilities, and much else, have combined, with the kindly and encouraging disposition, to build an honourable place, which cannot be disestablished, in the hearts of his fellow men and workers.

### Annual Meeting and Other Topics.

TURNING to the annual meeting of the Institution which will commence on Tuesday, June 11, at the Royal United Service Institution, under the Presidency of Mr. R. G. Shadbolt, the programme, it is found, is advancing in preparation. It is too early yet to make any prediction as to the technical proceedings; and, as a matter of fact, predictions in such a connection are usually falsified in the event. There will be the President's Address; and this is bound to supply much to stimulate thought. There will also be the Committee reports on different subjects of current importance. Up to the present, six papers have been accepted by the Council; and some of the titles suggest discussable topics. The Examiners in the Gas Supply and Gas Engineering Examinations of the City and Guilds of London Institute will be forward to tell of their experiences. The state of knowledge of distribution employees as displayed by answers to the questions in four years' examinations will be reviewed by Mr. J. H. Brearley; and Mr. Thomas Glover will furnish observations on the examinations in gas engineering. Dr. Lessing will describe a laboratory method for the comparison of the coking properties of coal. A large amount of modernizing work has been carried out at the Stockport Corporation Gas-Works; and Mr. Meunier, it is announced, will tell us of the "evolution" of these works. If he carries out the intention conveyed by the title, it should be a very long story; for the evolution of the Stockport works commenced deep down in the history of mundane affairs. A good current theme is the use of high-pressure gas for manufacturing purposes; and for the introduction of this subject, Mr. A. W. Onslow has made himself responsible. The concentration of a number of minds on the subject of the incidence of the day-load may broaden views, and open up new considerations; and therefore there will be interest in hearing Mr. H. Townsend's contribution in regard thereto.

The Parliamentary Committee of the Institution have work in hand that is of immense importance. They have among other things been directing their attention to the attitude of the Alkali Manufacturers' Association towards Gas Companies' Bills, and to the opposition of that commercially free body to the development of the residuals products business on lines of equal commercial freedom, so as to let the gas industry, as a whole, make to the full the best use they can of their residuals, to the benefit of the public and of their own undertakings. What has transpired in Parliament in connection with this matter is of common knowledge; but there will be some interest in learning that "the Council consider the opposition to be inimical to the "interests of the gas industry, and the Committee have "been authorized to give the matter their closest attention." It is to be hoped they will do so; and, moreover, that in the result there will be some immediate active concerted movement made in the matter. We have been looking for intelligence of an initial step being taken in regard to it by the Gas Companies' Protection Association; but so far that quarter has been as silent as the grave, though if ever there was a position in which the gas industry has been thrust by opponents, and in which its protecting machinery ought to be set actively to work, this is it. It will also be seen that the same Committee have before them the question of arriving at some agreement regarding the allowance for depreciation in respect of income-tax. The Inland Revenue authorities, as we have recently shown, are now evincing a spirit of compromise; and it may be expected that we are now within measurable distance of having the question, which has caused so much vexation and trouble, finally disposed of.

### Gas Analysis by Combustion over Cupric Oxide.

TOWARDS the end of last year, various articles appeared in our columns dealing with some of the latest methods devised for conducting the analysis of gases; and, in conjunction therewith, we emphasized the importance, on economic grounds, of very complete chemical control of the manufacturing operations of gas-works. It is a pleasure to find that the chemists engaged in the daily work of the gas undertakings in this country have of late been showing that inventive capacity is not confined to the manufacturers of chemical apparatus nor to eminent chemical professors and workers on the Continent; and further that, for the general advantage, there is a growing disposition among them to

bring the results of their research and successes in improvement of chemical apparatus and method into the light of day. Publicity of all such matters is not only of common interest, but it tends to the welfare and advance of the gas industry generally.

To-day, we are publishing the first part of an article, by Mr. J. G. Taplay, of the Gaslight and Coke Company, that we believe will be of very special interest and value. The author has for some years been working upon the method of gas analysis by combustion over cupric oxide; and after reading his article, with its valuable, compendious notes and instructions, which carry the student and the worker from the *alpha* to the *omega* of the subject along an orderly line of progression, there can be no doubt about Mr. Taplay having got to the very root of this particular method of analysing gases. He has devised a new apparatus for the purpose (which, by the way, is being made by Messrs. Alex. Wright and Co.); and this apparatus shows a constructive ingenuity which will be appreciated by those who have worked to any considerable extent on the fractional combustion of gas mixtures over cupric oxide. Among the more notable features is this: The high temperatures that are essential for many combustions under this method are in excess of the resisting capacity of even hard combustion glass; but Mr. Taplay has found a satisfactory solution of the difficulty—a solution proved by many hundred combustions—in tubes made of clear, fused silica.

The author is clearly and properly punctilious over the matter of detail. Nothing is more necessary to accuracy in chemical investigation. Therefore he supplies the manipulative detail in gas analysis by the cupric oxide combustion method in a practical way, all arising out of his own extensive experience. This gives confidence in saying that the guidance offered here will be highly valuable, and much appreciated by chemists who have this class of work to carry out. To those familiar with gas analysis, it will be obvious that not only the apparatus but the method is exceedingly simple, and that the operations can be rapidly performed. We believe that instrument and method will be very helpful to those gas makers who wisely have recourse to chemical control; for here is a ready and reliable process not only for the accurate estimation of hydrogen, methane, and nitrogen, but for the determination of the carbon values of the olefines. By this means the calorific values of a gas can be easily calculated. These few observations upon salient features will obtain for Mr. Taplay's extended article the consideration that its usefulness deserves.

## Gas Workers and Trade Unionism.

The Gas Workers' Union are making another attempt to get the gas workers of London back to the unionist fold; and meetings are being held for this purpose. But the first one was, in the matter of attendance, a painful failure for the organizers; and the reason attributed was that someone among these men who are prepared to "scientifically" organize the gas workers of London, if the gas workers are silly enough to let them, had forgotten such an important detail as the announcement of the time of the meeting. Though the hearers were comparatively few, the words uttered on the occasion were copious. If there had been present the great majority of gas workers of London who are thankful that their lot is a far more pleasant one than it was some years ago, they would not have recognized the terrible picture that was drawn of themselves. They would have heard that they are discontented, were suffering from cruelty and tyranny (as though these were the days of slavery), and were the victims of a fraud in respect of co-partnership. Labour is free. The few gas workers who may hold such beliefs are quite free if they so will to leave the employ of the Companies, have their co-partnership stock and savings handed over to them, use the money for maintenance until they obtain work elsewhere, and then afterwards start life afresh without co-partnership, but as weekly contributors to the Gas Workers' Union. There is no power on earth that can compel them to be the victims of the alleged cruelty, tyranny, and fraud. One speaker at the first meeting in the campaign stated that the gas workers on both sides of the Thames had asked the Union to reorganize them; but if there was that generous willingness to enlist again under the banner of the Union, there would be no need for these meetings with their torrential speeches. We like truth; and Mr. Will Thorne, M.P., candidly confessed that in London the gas workers had not kept together under the banner of the Union, and that they were indifferent to organization. There must assuredly be a good and sufficient cause for the great mass of the gas workers who are employed in London not continuing under the Union banner and for their indifference; and it would be better for the Union leaders to look the matter fairly in the face, accept the correct reason, and act the manly part of abstaining from besmirching, in an unfair manner, persons and conditions with better objects than their own.

Mr. Thorne knows full well what is the cause of the content that now keeps the mass of the London gas workers from rushing into the open arms of the officials of the Gas Workers' Union. He himself mentioned it when members of Parliament were asked to sign a memorial to the Government praying for the appointment of a Commission to consider the subject of co-partership in relation to the large problem of labour unrest. He said then that he could not sign the memorial (which, we learn, is now under the consideration of the Government in association with other labour questions) because co-partnership is the enemy of, or is opposed to, trade unions. It is hard to see how it can be if it creates such dissatisfaction as the speakers at the Canning Town meeting asserted now exists in the London gas-works. It is difficult to reconcile such statements. Co-partnership was also described as a "hopeless fraud." That hopeless fraud has a very substantial look about it in the matter of accumulated bonuses—both withdrawable and undrawable—and voluntary savings, all put by for old age, or other use on leaving the service of the companies who have enabled such accumulation to be made. This solid representation of the personal monetary reserves of the co-partnership workers, has never, and could never, be produced by trade unionism without co-partnership. On the contrary, the union demands subscriptions from the men for use in fighting against the interests of co-partnership, which Mr. Thorne acknowledges to be so inimical to the trade unions. There we have the reason for this attempted new agitation on the part of the Gas Workers' Union. They want more money; and they want the gas workers of London, if they can get them to do so, to find it. They have had to dip deeply into their funds just lately through a national strike; and coincidently the officials of the Gas Workers' Union are in favour of the amalgamation of all trade unions. This policy—a policy of consolidation of the unions that is much in the favour of the extremists among the leaders—requires large sums of money in the trade unionist coffers. The recent strike has proved this; hence the anxiety to get the weekly subscription from a few thousand London gas workers.

We have sufficient confidence in the good sense of the London gas workers to know that the answer of a vast majority to the present agitation will be that the best form of trade unionism of which they know and have had real experience is co-partnership; and that its organization, objects, and results are on a level that militant trade unionism of the kind favoured by the Gas Workers' Union can never reach.

## Private House Lighting.

An interesting, but not particularly instructive, meeting was held by the Illuminating Engineering Society last Tuesday. The subject under discussion was "Private House Light-"ing;" the authors of the two papers read being Mr. W. R. Rawlings (for electric lighting) and Mr. W. H. Y. Webber (for gas lighting). The authors adopted different modes of attempting to create an impression—Mr. Rawlings by largely confining himself to the illumination by electricity of town and country mansions; Mr. Webber by indulging in periods—philological and historical—and, otherwise, by confining himself to the lighting of houses rented at £40 a year. The method of treatment narrowed the consideration of the subject considerably by members of a Society concerned with modern conditions and a broad outlook. Anyone who might have been present and was not aware of the nature of the lighting business done by the electricity and gas supply industries, might well have imagined that the former had its enterprise limited to mansions, and the latter to middle-class residences. Whereas the truth is that the gas industry has no bounds set by the size of property to its business relations; and the electrical industry will not be prepared to admit that it has not penetrated to a lower stratum than the rich man's house, though there are considerable financial obstacles to the making of headway by

electricity in the quarters in which the great masses of the population reside.

Mr. Rawlings only touched lightly (some may say slightingly) upon those quarters—looking at them from the electrical industry's point of view. He emphasized the fact that there is not much scope for that industry nor for the illuminating engineer in the cottage of the artizan, where the family spends its evening round a single lamp—a lamp which nobody can deny can be supplied of a higher illuminating power and at a lower cost by the gas industry than by its chief competitor. Then as to the middle-class house, Mr. Rawlings sees a much greater demand there for increased illumination and decorative effect; but within those houses he finds there are natural limitations to expenditure. And a good and growing expenditure is what the electricity industry exacts from patrons from the time the agreement is signed for a supply of current throughout the continuance of business relations. All Mr. Rawlings' illustrations showed clearly that, if decorative effect and excellent lighting, and the suppression of defects that are opposed to physiological laws in connection with electric lighting, are required, then a luxurious outlay is a necessary accompaniment. As an electrical contractor, Mr. Rawlings has an intimate acquaintance with facts and figures; and he let light on to his own personal views by those brief references to the artizans' dwelling and the habitations of those described as the "middle class"—so described for no other reason than that they are not endowed with this world's goods in the same opulent manner as those who come under the appellative term of the "upper class." Position and necessity lay on the so-called "middle class" sumptuary laws; but wealth does not offer any line of demarcation to the use of gas for lighting purposes in dwellings of a larger order than those occupied by the middle class, of a £40 or thereabouts rental power. It was only recently that a Past-President of the Institution of Electrical Engineers [*ante*, p. 16] attempted to constitute the illuminant that a man uses as the visible sign of his wealth or poverty. If it were truly so—and we know that it is not—then it would have been a graceless act on the part of one ranked on the side of the wealthy by the visible sign of his use of electricity for lighting purposes to have thrown their personal poverty into the teeth of the users of gas-lamps for lighting.

However, from our report of the papers and discussion at the meeting of the Illuminating Engineering Society, we have eliminated much that is plutocratic, philological, and historical, and extracted the practical parts. Neither paper was featureless in this respect. But when all is said, it may be summed up in the truth that the lighting of private houses cannot be reduced to any special formula in the matter of the details of installation. General rules may be borne in mind; but the most astute illuminating leader cannot alter individual tastes, and the essentials imposed by convenience and surroundings. Mr. Webber does not find place for the nomenclature of the illuminating engineer in any dealings with the private householder; and the illuminating engineers concurred with him. But there is an abundance of educational work that can be diplomatically done by suppliers of the illuminating agents before which the tastes of private householders that ravish all the proprieties in the matter of artificial illumination may become subdued. That is the direction in which the road for work is open, and the best way for this work to be done is by demonstration in rooms furnished in modern style. Such rooms may, without troubling the layman, be arranged in the matter of illumination with all the aid that can be rendered by foot-candle measurements and the accessories that go to produce physiological perfection. Though a layman knows nothing about the rules governing what is presented to him as an object-lesson, he will recognize good lighting and absence of imperfections from which he may have previously suffered. The private householder must not be left to his own devices. He can be led; and in the matter of high-class gas equipment, not a few will have found persuasion in the gas-lighting demonstration stand of the South Metropolitan Gas Company at the now-running Ideal Home Exhibition.

## Vertical Retorts and Steaming.

It is an excellent thing that the Committee of the Midland Association have decided to postpone the discussion on Dr. Davidson's "Studies in Carbonization" until the autumn, as the more the Doctor puts forward for consideration in his articles the more does he tread intrepidly upon grounds where there has been, and is still, acute disagreement. Such a matter, however, as the relative advantages and disadvantages of steaming in the last stages of distillation in vertical retorts on the intermittent system as compared with producing water gas separately, and then utilizing it with straight coal gas from the verticals, ought to be one that should be amenable to settlement by concrete facts. Yet in Germany it has been the subject of very keen controversy; and gas engineers and chemists have taken sides, and have indulged in the sharpest criticism of the opposing modes of procedure. What is peculiar is that, despite the longer and enlarged experience, the adherents to the contrary practices remain as steadfast as ever to their own particular view. Dr. Davidson, in the fresh contribution to the results of his studies published this week, treats of this question; and he ranges himself on the side of those who believe there is financial and qualitative benefit to be obtained from steaming in vertical retorts. The case and the evidence he presents will be closely scrutinized in this country (where, owing to the illuminating power standards, steaming is not favoured), and in Germany where the Dessau method of steaming has such a large number of followers. At one time it was believed that the steaming would have a detrimental effect upon the stability or wear and tear of the retorts. But excessive ill-effect seems to have been a creation of the imagination, when we find the vertical retorts at Mariendorf (where the system of steaming has been consistently practised) held up as illustrations of the longevity that may be looked for in intermittently worked verticals.

## Coal Storage, and Air in Lime Purification.

Some sound advice was given in an address by Mr. Alex. Wilson to the Scottish Juniors last Saturday; and they will not fail to profit from counsel based on such a broad experience. There are two points in the address that particularly attract attention. Mr. Wilson is the first engineer and manager of a large works to speak since the national stoppage of coal supplies, and the subject is naturally uppermost in his mind. The trend of labour events is adding to the responsibilities of chief officials, and creating for them new problems. One of the problems in future will be as to what will be a safe storage with labour movements departing from the sectional to the national order. As Mr. Wilson points out, this strike has upset all the well-matured rules and regulations that gas managers laid down for themselves in times past in the matter of coal stocks. Even those near the sources of coal who have hitherto not seen any occasion to maintain any considerable stock have found on this occasion that they were no better off than those a hundred and more miles from the coal-pits—in fact, certain of the gas undertakings near to the latter have been worse off than those a distance away, simply because of the comfortable assurance that proximity to the coal-pits have hitherto given them. We see that some of the miners' leaders have pointed out that one of the mistakes of the recent strike was that they gave large users time to well stock their stores; and they advise that this must not happen again—not only in the case of a strike of miners, but in that of workers connected with transport. This means that a permanent larger margin of safety in the matter of stocks will have to be adopted. The second notable point in Mr. Wilson's address referred to the admission of air into lime-purifiers. This was a subject that was brought before the Association in February by Mr. R. B. Leckie, of Holytown, who stated that he admitted into his lime-purifiers 3 per cent. of air, varying down to 2 per cent.; and this had a material effect in reducing the purifying costs. For lime purifiers, 3 per cent. is rather high; practice generally pointing to a maximum of 2 per cent., where the sulphuretted hydrogen per 100 cubic feet is heavy, with 1 per cent. as a preferable figure. Mr. Wilson favours 1½ to 2 per cent.; and he tabulates figures which show that, by using such a percentage of air, there is good increase in the efficiency of the lime-boxes.

## Retort-House Practice.

It was a very practical paper that Mr. T. Brooke read before the Yorkshire Junior Association last Saturday, on "Some Phases of Retort-House Practice." It is clear from the communication that the author is by no means disposed to accept good or ill report as final about anything appertaining to retort-house practices without putting them to the test on his own account. This being so, in some respects, he finds himself at variance with commonly accepted notions on certain matters. He only deals with three or four details of retort-house working; and these suffice for a long

paper with something fresh in each part. We find him strongly in favour of the single ascension-pipe, using partially filled retorts; and he deals very fairly with the arguments on both sides. But we have heard from several quarters lately that the single ascension, pipe is not loved for more than one reason, and that the ascribed advantages are found to be counterbalanced by the disadvantages. Mr. Brooke says that, with the single ascension, there is, in comparison with the double ascension, a greater yield of gas of equal illuminating power and increased calorific power per ton of coal. But he admits that there is a little more decomposition of hydrocarbons than when two pipes are employed. On the other hand, the light oils that would otherwise be found in the tar are converted into gas. The single ascension prohibits the use of well-filled retorts. If there were two ascensions, the retorts could be heavily charged. There would then be less decomposition of the hydrocarbons; the tar would not be deprived of some of the light oils that should give it additional value; and, moreover, the sad experience that some engineers. using the single ascension, have had with increased sulphur compounds, which have thrown additional work on to the purifying plant, would be avoided. Balancing considerations and effects, certain engineers are not to-day so keen about single ascensions as they were when drawing the plans for the house in which they have reaped their experience. The paper also contains criticism of the retort-house governor, and then of hot patching cement, upon which latter Mr. Brooke tells of disadvantages, and confesses he does not know of a really good material in this line. On the question of the working of tar towers and mains, he has come to the conclusion that more scientific treatment and investigation are required. To sum up, it is pretty evidently the opinion of the author that retort-house work is regarded in a too general light, and that closer consideration of details would lead to still greater improvement in results.

## A View of Industrial Unrest.

Among the many recent opinions that have been expressed on the subject of industrial unrest, may be noted a contribution to the "Dundee Advertiser" by Mr. James Keith, who urges what he regards as the only possible solution. Starting with the assertion that the real cause of the existing general great labour unrest is the growth among the working classes of knowledge and enlightenment, which have given rise to a desire for a more equitable division of the wealth and good things produced by physical toil, the author remarks that unfortunately the workers, as well as employers of labour, have not yet been able to get beyond the idea that force alone is the only remedy. Employees will not give up their right to strike, and employers insist upon their right to lock-out their workers—both sides forgetting apparently there are infinitely better and more reasonable, and more scientific, ways available for the settlement of industrial troubles in the twentieth century. The suggestions now being made by some of the largest employers in the country, to form a great federation of capital for the purpose of fighting to a finish an equally great federation of labour, are, he thinks, made in forgetfulness of what has been going on in the United States for the past quarter of a century in this direction, and its present results—practically industrial civil war, and chaos all round. The fight to a finish proposition, it is urged, ought surely in these days to be looked upon by both sides as the counsel of despair. Referring to the trade unions, Mr. Keith points out that they are legalized by Acts of Parliament, and expresses the opinion that, with all their faults and failings, they have done more to benefit the working classes, as well as the employers concerned, and to prevent revolution in this country, than any other society or brotherhood of a like nature. Instead of following the example of America, he hopes that we shall agree to settle our industrial or labour problems peacefully and constitutionally by means of impartial tribunals formed of, or presided over by, His Majesty's Judges of the High Court, the decisions of which, backed up by public opinion, would be bound to prevail. Reverting to federation, Mr. Keith asks why a really great federation of capital and labour should not be formed for the purposes of removing grievances, ameliorating the conditions of the workers, increasing the efficiency of labour, giving stability to the existing order, securing (if possible) unruffled peace and brotherhood, enabling the workers of the coming generation to take a big step forward, and bringing to an end internal industrial strife by making it absolutely impossible.

# OBITUARY.

The death occurred last Thursday, at his residence in Lancaster, of Mr. James Jowett, the Managing-Director of Coalexld Limited, which he established about four years ago. He had for some time suffered from asthma and bronchial complaints; but during the past year his health had gradually become worse. He was, however, at business as recently as a week before his death. He was about seventy years of age, and leaves a widow and a son.

Mr. Walter Cawood, a well-known exhibition promoter, died suddenly from pneumonia at his residence in Ellesmere Park, Eccles, near Manchester, on Saturday, aged 47 years. Mr. Cawood promoted over 100 exhibitions, most of them in Manchester—first at the St. James's Hall (now demolished) and subsequently at the City Exhibition Hall in Liverpool Road. Many years ago, on the conclusion of a successful gas exhibition at the St. James's Hall, Mr. Cawood was entertained at dinner by members of the gas industry, and presented with a handsome testimonial by them in recognition of his work.

Sir Bosdin T. Leech, the Chairman of the Manchester Corporation Water Committee, died last Tuesday, at his residence in Timperley, aged 76 years. He had been ailing for some time; and the end was not unexpected. Sir Bosdin was an Alderman and ex-Mayor of the city; and it was in 1906, on the death of Alderman Sir J. Harwood, that he was elected Chairman of the Water Committee, having previously been Deputy-Chairman. In the development of the Thirlmere water undertaking, Sir Bosdin Leech took a deep interest. It was on the occasion of the official opening of the Ship Canal in 1894, by Queen Victoria, that Alderman Leech, as Mayor of the city, received the honour of knighthood. He was one of the most consistent and sanguine supporters of the Ship Canal scheme from its inception. Though the name of the deceased is closely associated with a great water undertaking, he was also in touch with the gas industry; having been a Director of the Stretford Gas Company. In this capacity he was present at the luncheon on the occasion of the visit of the Manchester District Institution of Gas Engineers to the town in the autumn of 1910, during the presidency of Mr. Kendrick, the Company's Engineer and Manager. Sir Bosdin Leech came of an old Stretford or Urmston family, and wrote a long and interesting series of reminiscences of life in the borough in early Victorian days. He joined the Stretford Local Board (as it then was) in 1874, remaining a member until 1881, and holding the position of Chairman for two years. At the funeral, which took place at the Southern Cemetery, Manchester, on Friday, the Stretford Gas Company were represented by Mr. Edwin Hibbert, the Deputy-Chairman, Mr. Lewis Galloway, an ex-Chairman, Mr. Thomas Lunt, a member of the Board, and Mr. H. Kendrick, the Engineer and Manager.

## The Late Mr. C. F. Ruggles.

The last number of the "Journal" contained an appreciation, from personal knowledge, of the late Mr. Charles Frederick Ruggles, the Secretary and Manager of the Leighton Buzzard Gas Company, whose death occurred the previous Friday. We supplement the remarks then made by the following particulars of the life-work of the deceased which have since come to hand. Mr. Ruggles was born at Ipswich, and in early life held an appointment with the Gas Company in that town. But in 1884, he removed to Leighton Buzzard, to take the position of Secretary and Manager of the Gas Company, in succession to Mr. W. T. Batten. At that time the works were comparatively small; but under his supervision they were entirely remodelled. More economical working was ensured, with a consequent lowering of the price of gas. Absorbing as were his duties in connection with the Gas Company, they did not engross the whole of his time and energy. Shortly after his arrival in the town, he joined the Fire Brigade, and was its Captain for a quarter-of-a century. He relinquished the position only a few months ago. He was a member of the District Council up to the time of his death; and his contributions to the discussions were always shrewd and very businesslike. He took a keen interest in music, and was for seventeen years Choir Master of All Saints' Church. He was an ardent Freemason, and was a P.M. of the Beaudesert Lodge, a P.P.G.Std.B. (Beds.), and a member of the St. Barnabas Lodge. He joined the Gas Institute shortly after obtaining the appointment at Leighton Buzzard, and did not sever his connection with it, but passed with his professional colleagues into the present Institution. As mentioned last week, he was a member of the Eastern Counties Association; and he was also on the roll of the Southern District Association. He was Managing-Director of the Fenny Stratford Gas-Works. His two sons are in the profession—the elder (Mr. H. G. Ruggles) being Secretary and Manager of the Irthlingborough Gas Company, the younger the Assistant-Manager of St. John's (Newfoundland) Gas Company.

**Informal Meeting of Scottish Gas Managers.**—This meeting will be held next Friday afternoon, at the Grand Hotel, Glasgow, under the presidency of Mr. James M'Leod, F.I.C., F.C.S., the Gas Engineer and Manager to the Corporation of Greenock. After the business, dinner will be served; and a presentation will be made to Mr. W. B. M'Lusky, now of Halifax, and for the past nine years the Convener of these anuual meetings.

## INSTITUTION OF GAS ENGINEERS.

### The Annual Meeting and other Matters.

We have received from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) the following notes of the proceedings at a meeting of the Council held last Wednesday, at the Offices—the President, Mr. R. G. Shadbolt, of Grantham, in the chair.

It was reported that Mr. H. E. Jones had offered to continue the London Medal for a further term of years, which the Council were pleased to accept; that the award should constitute a class of itself, in accordance with the conditions of the doner; and that the Institution should offer annually a gold, a silver, and a bronze medal as first, second, and third awards respectively.

Further consideration was given to the question of celebrating the Jubilee of the Institution in 1913; and it was reported that the proposals for a gas exhibition to be held in London were assuming definite shape. The Committee appointed to act, in conjunction with a similar Committee of the Society of British Gas Industries, were empowered to proceed with the working-out of the details of the scheme, which would be announced in due course.

The Council had approached Mr. Thomas Newbigging with the suggestion that he should sit for his portrait in oils, to be presented to him by the members of the Institution during its Jubilee year, in recognition of his long and honourable connection with the Institution from its formation as the British Association of Gas Managers, and the many services he had rendered to the industry. It is pleasing to report that Mr. Newbigging has fallen in with the suggestion of the Council, who feel sure that every member will be glad of the opportunity of participating in the presentation.

The provisional programme of the annual meeting, which is to be held at the Royal United Service Institution, Whitehall—opening, as already announced, on Tuesday, the 11th of June—was further considered, and the following communications were accepted for reading:—

"The State of Knowledge of Distribution Employees, as Displayed in the Answers to Four Years' Examination Papers," by Mr. J. H. Brearley, of Longwood.

"Some Observations on the Examinations in Gas Engineering," by Mr. Thomas Glover, of Norwich.

"A Laboratory Method for the Comparison of the Coking Properties of Coals," by Dr. R. Lessing, of London.

"The Evolution of the Stockport Gas-Works," by Mr. S. Meunier, of Stockport.

"High-Pressure Gas for Manufacturing Purposes," by Mr. A. W. Onslow, of London.

"The Incidence of the Day Load," by Mr. H. Townsend, of Wakefield.

The Parliamentary Committee reported that they were entering, with representatives of a number of gas companies, into the question of depreciation allowance for gas undertakings for income-tax purposes, with a view to arriving at some acceptable basis of settlement. On the recommendation of this Committee, consideration was given to the opposition of the Alkali Manufacturers' Association to the residuals clauses in Bills now before Parliament; and as the Council considered this opposition to be inimical to the interests of the gas industry, the Committee were authorized to give the matter their closest attention.

The scheme of the Special Committee on the Education and Certification of Gas-Fitters was submitted, and was adopted by the Council for recommending to the general meeting of the Institution.

It was reported that the resignation of Professor W. A. Bone, D.Sc., F.R.S., as Livesey Professor of Coal Gas and Fuel Industries, had been accepted by the Senate of the Leeds University, and that steps were being taken by the Advisory Committee and the Senate for the appointment of his successor.

## BRITISH COMMERCIAL GAS ASSOCIATION.

### Meeting of the General Committee.

The General Committee of the British Commercial Gas Association, at their meeting on Tuesday last, decided to hold the First Annual Meeting and Conference of the Association in Manchester on Tuesday and Wednesday, the 8th and 9th of October next.

The Executive reported that, through the good offices of Mr. Councillor Kay, of Manchester, and Alderman Phillips, the Mayor of Salford (who have, from the very first, taken a keen and active interest in the work of the Association), the Lord Mayor of Manchester had kindly offered the loan of his parlour (which has seating accommodation for about 400) for the occasion, and had also promised to receive the members on the opening day of the conference.

The General Committee passed a resolution embodying their acceptance, and cordial appreciation, of the Lord Mayor's hospitality, and their thanks to Councillor Kay and Alderman Phillips. Councillor Kay was, unfortunately, unable to be present at the meeting; but Alderman Phillips, in acknowledging the resolution, promised, on behalf of Manchester and Salford, that everything possible would be done on their part to make the conference of the Association a success.

The Executive reported having received a very friendly letter from the National Commercial Gas Association of America, together with copies of their publications; and the members of the General Committee who were present decided to apply for membership of the American Association, and to offer facilities to members of that body to join the British Commercial Association, so that there might be full interchange of literature and the fullest possible co-operation between the two Associations.

As readers have, no doubt, observed, the advertisements of the Association are now appearing in both daily and weekly papers of general circulation; and these advertisements are, we understand, creating widespread interest among the public.

## ELECTRICITY SUPPLY MEMORANDA.

### The "Electrician's" Surprise—A Rickety Piece of Criticism—Standardized Baking—Evaporation at Raw Meat Values—Baking not the Only Cooking Operation—No Authoritative Electric Tests—Silly Electrical Statements—A Failure at Liverpool—The Flights of Excessive Enthusiasm—Financial Considerations.

As we have before pointed out, the Commercial and Industrial Supplement of the "Electrician" is often surprised at things the "Journal" does, but it is never surprised at its own peculiar notions and criticisms regarding various subjects affecting the gas industry. The statement carries quite sufficient explanation. The latest matter that has caused surprise to our contemporary is that we should have published the results of the Brighton and Hove Gas Company's comparative tests with gas and electric cookers, and of the tests previously made with Mr. Potterton's "Sealed" gas-oven—in fact, we ought, according to our contemporary's cookery authority, to have known better. Let us endeavour to see, by the shocking bad light of our contemporary's criticism, wherein we erred. In the first place, it would be an advantage if the "Electrician" would frankly tell us whether it has anything to say regarding the personal honour and probity of Mr. Joseph Cash, M.Inst.C.E. (misdescribed by it as Mr. G. Cash), Miss Mary Weston, and Mr. P. E. Browne. That lady and these gentlemen are as conscientious in their work as any one on the staff of our contemporary, or in the electrical industry. The tests that were made with the Potterton "Sealed" oven cooker, too, were carried out by a lady expert who stands second to none in the art of cookery. There is nothing more detestable in criticism than oblique insinuation as to the *bona fides* of individuals.

It will be sufficient to confine our attention to the Brighton tests. There is much in the article referring to them as published by us to which our contemporary dare not and cannot reply. But it asserts without a due sense of the responsibility attaching to criticism touching persons that those who carried out these tests are "necessarily biassed, and the tests seem careless." It goes further, and airily says "the figures actually prove it, and are therefore unreliable." In another place the results are described as "obviously unfair." Are the figures really unreliable? We have examined them again, and have come to the conclusion that the necessarily unbiassed and most careful of critics who wrote the comment in our contemporary should go to a cookery school, and be instructed how to apply reasoning to the art of cooking. The figures that he says prove his allegations, or (more correctly) innuendoes regarding the personal honour and care of the Brighton investigators, are these: That in No. 1 test, the "Tricity" oven was on 1 hour 45 minutes, and 2 units of electricity were consumed; in No. 2 test, it was on 1 hour 4 minutes, and took 2·7 units; and in No. 3 test, it was on 1 hour 9 minutes, and only took 1·8 units. Then comes a further personal attack when it is said that "each test, of course, favours gas, and small wonder when all the figures have been carelessly handled as in the above tests." It would have been honest on the part of the "Electrician" to have told its readers the whole of the facts. It would not have ill-become it to have mentioned that, after test No. 1 (this is clearly pointed out in our article), Mr. Cash, in order that the results as to current consumed should be above suspicion, purchased a special electric meter to ensure reliable registration. The figures quoted in all tests succeeding No. 1 were the registrations of the more exact type of meter. In all the tests different things were cooked; and is it beyond the scope of the knowledge of the critic on the staff of our contemporary that different articles of food require in baking different times and different temperatures? Time, temperature, and consumption of current have not been, and cannot be, standardized to apply to all cooking operations, any more than Nature has seen fit to standardize the characteristics of joints of meat. Where, then, is the foundation for the charge that the tests and the figures were carelessly handled by Mr. Cash and Miss Weston and Mr. Browne? Different things were being cooked requiring different times and temperatures. The proof that Nos. 2 and 3 tests were not "carelessly" made with the electric-cooker is found in the footnote to the respective tables "food excellently cooked," and "food well cooked."

We go further, and find that Mr. Cash and the "Journal" are charged with omitting to regard the value of the saving of meat with electric cooking, and its influence on the bill for electric energy. Why did not the critic say all the figures as to any differences in

weight of meat that were found were fully set out in the article in question, as plainly as type and printers' ink could in the space at command make them? The critic's omissions render his comments void of that candour which would have been more graceful than his rickety manner of dealing with the tests. We have him saying that "every ounce of meat (beef) is worth ½d. taking the average price at 10d. per lb.; and this amount must be placed to the credit of the electric-cooker. Poor electric cooker! Are all your alleged virtues to be propped up by this played-out farce of crediting you with any undercooking, or lessened evaporation of the volatile constituent of meat, and charging it up at the price of raw meat? There are only two instances in the Brighton tests in which meat was cooked; and in the one case in the electric-oven the "joint was not well cooked," and in the other "the joint was not crisp." If the critic doubts the veracity of these assertions of the lady and gentlemen who appended, and who had not the slightest hesitation in appending, their names to the tests, let him say so boldly. If the meat had been cooked in the gas and electric ovens equally, at the same temperatures, and therefore in the same time, there is no reason, given two joints equal in first weight and constitution, why their after-cooking weights should not come out in every respect approximately the same. Unfortunately, too, for the electric-oven, baking of meat is not the sum of heat requirement in cooking. The system of regulating temperatures and time so as to show weight savings in meat can be made to apply to the gas-oven as well as to the electric-oven; but such really fictitious saving will not, in the case of the electric-oven, compensate for its other infirmities in meeting the needs of the kitchen in the matter of expense, time, reliability, and maintenance. The insinuations of unfairness and carelessness come with very bad grace from a quarter in which there has been published matter in connection with this subject largely in abuse of the gas-oven, which it was our duty to severely criticize, and to which criticism there has as yet been no answer upon the main points.

There is one other matter. It is this: Although general statements have been flying about in the electrical press and electrical advertising literature that the loss of "meat" baked in gas-ovens represents a percentage in weight of the raw meat running anywhere from a figure that is always beyond the loss in the electric cooker up to (according to the rashness of the authors) 50, there has never yet been any account published regarding tests and results by anyone in the electrical industry that has included the name of the gas-stove used in comparison with the electric-cooker, that has given the name of the cookery expert who has carried out the tests, the names of those who have checked the tests, and the actual weights, times, consumptions, and costs, embracing also the baking and boiling of different kinds of foods, including the provision of hot water—nothing whatever to compare with the full record divulged by the Brighton figures. Nothing has been hidden in these Brighton tests; all is open to the view of the electrical industry. Under such circumstances, it does not stand to the credit of any electrical paper, claiming technical status, to meet such a record with superficialities and cheap insinuations against those who have carried out the tests. The Berry Construction Company, who are running the "Tricity" cooker, have a copy of the "JOURNAL" containing the tests; but they have not up to the present had a word to say in our columns in criticism of the figures. We know sufficient of the Brighton and Hove Gas Company, and of their Engineer and Manager (Mr. Joseph Cash), to enable us to say positively that there is not the slightest doubt they would willingly arrange for Miss Weston to repeat the same tests before a representative of the "Tricity" electric cooker vendors, on the condition that the "Tricity" people would be willing to have the weight, time, consumption, quantities of food, and cost figures for every operation (starting cold) in cooking—from baking to water boiling—published broadcast with the signatures of Miss Weston and the "Tricity" representative attached. We do not think that the "Tricity" representative, after the test, would be prepared to subscribe to the absurdity lately published by the "Electrical Review" from the pen of Mr. H. E. Goody in this passage: "Taking into consideration the fact that with the former [the electric] method, the food loses *neither weight nor flavour*, while with the latter [the gas-cooker] it loses a *large proportion of the one* and *all* the other, it may be safely asserted that electricity for cooking is cheaper than gas." It is a pity that such trashy, untrue statement has not the blue pencil run through it by those responsible for the exercise of that serviceable article in the editorial equipment. Let the Editors of our contemporary apply a little nous to the statement quoted, and then reply to these two questions: Is it possible to cook meat by any means without loss of weight? And in regard to flavour, is it possible to count the number of gas-cooked dinners that the Editors of our contemporary have enjoyed in the course of their lives? The present writer has had the pleasure of seeing them at not a few. Then why should the "Electrical Review" belittle itself by allowing such statements to appear in its columns.

As attention was about to be devoted to Mr. Goody's article and to some remarks, tuned-up to the top note of enthusiasm in the "Electrical Times'" Installation Topics, a paragraph in the morning papers informed us that just before nine o'clock on Monday evening of last week the entire electric supply of Liverpool failed, without the slightest warning. The streets electrically lighted were plunged in darkness, electric cars came to a standstill, exciting scenes were "witnessed" (though in dead darkness) in the theatres—many ladies among the audiences going into hysterics. For three-quarters of an hour this continued. This is another illustration of why no place of public assembly ought to be without an alternative system of lighting where electricity is employed. Consideration at the time being turned on cooking, we wondered whether there were any unfortunate users of electric-cookers in Liverpool who were depending upon them for a hot supper. There might have been, because the writer in the "Electrical Times" reckons that the electric-cookers in use in the country must now exceed 10,000. His enthusiasm leads him on. "Nothing," he says, "can now stem the tide which has set in with a rush in favour of electrical operation in the kitchen." Then—*ora pro nobis!*—"we are glad to note that in many towns hiring schemes for electric cooking and heating apparatus are now being adopted; and when, *as is inevitable*, these become the *general* thing, the gas-cooker will feel the draught to such an extent that it will have a hard struggle to survive, and certainly will not be able to do so at all in its present imperfect form." Of course, if electric-cookers become the "general thing," there will be no gas-cookers left to feel the draught. The song of triumph swells louder and louder. The signs of the times are shown by "more than one well-known firm in the gas business making electric cookers." The Carron Company who started making coal stoves and still do so, and who afterwards made gas-stoves and still do so, have latterly produced an electric cooker, the complete outfit of which the "Electrical Times," in another place, says (without installation) costs £21! Who are the other "well-known" makers of gas-stoves who have entered as makers of electric cookers? If any gas man feels uneasy by the flights of the "Electrical Times," he may apply to Mr. Goody, already quoted, for an antidote. This sprightly individual says there are plenty of good electric-cookers on the market; the trouble is that "they have been taken up so little." There are only a "few thousand" of them in use in Great Britain; and he can "personally vouch for the fact that, in one of the largest metropolitan boroughs, there is not a single electric-cooker connected to the mains." In some of the London electric showrooms, however, inquiries for cooking apparatus average five or six per day; but the inquirers go away overpowered by the question of initial and installation expenses.

There is nothing else to be done, in Mr. Goody's opinion, than for the electricity industry to follow the example of the gas industry, and provide electric-cookers on the same terms. Let us see how that would work out. A biscuit-tin form of electric-cooker, with very limited capacity, costs (say) 11 guineas without fitting up. Supposing with this cheapest form of electric-cooker, the electrical industry displaced the 3 million gas-cookers in the United Kingdom, the £11 11s. would represent about 34¾ millions sterling, without fitting up. The most expensive parts of an electric-cooking outfit are the heating elements and the connections; the lives of these most expensive parts are the shortest of any in the electric-cooking outfit. The wearing parts in a gas-cooker are few; their lives are long; and renewals are quite inexpensive. Therefore, a nice little financial calculation for our electrical friends is as to whether provision for sinking fund, renewals, and interest on this line of business (altogether apart from any question as to the merits and demerits of their electric-cookers for baking and boiling) would really constitute a paying proposition with electricity at 1d., ¾d., or ½d. per unit. These prices bring us to the point as to what would be the financial effect on the central stations and distribution systems with the present conventional short feeding hours. That is a point worth discussing by our electrical competitors. For a little guidance in this matter, "Meteor" of the "Electrical Times" should be consulted. He has a sharp eye on the distribution problem; and he consequently does not share the enthusiasm displayed by his "Installation Topics" colleague. In another article in the "Electrical Review" by Mr. C. H. Wordingham, M.Inst.C.E., we have further contradiction of the "boom" in domestic electrification. This gentleman finds the financial consideration, the ill-design of apparatus for domestic purpose, and the provision of hot water difficult obstacles to surmount. No one touches the relative number of B.Th.U.'s sold by gas and electricity suppliers for a given price. That is a tender spot with our commercial rivals.

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**North of England Gas Managers' Association.**—It has already been mentioned in the "JOURNAL" that one of the features of the half-yearly meeting of this Association, to be held on the 4th prox., will be a paper read by Mr. R. Nelson, of the East Hull Gas-Works. We learn from the programme issued by the Hon. Secretary (Mr. Herbert Lees, of Hexham) that the title will be "Extensions to Carbonizing Plant at East Hull, with Notes on Working Results." At this meeting, the office-bearers for the ensuing year will be elected.

**Progress of the Rotary Meter.**—The growing popularity of Mr. T. G. Marsh's rotary meters is evidenced by the fact that they are now measuring annually over 150,000 million cubic feet of gas in the United Kingdom, and over 135,000 million cubic feet in the United States. The meters are being increasingly adopted in connection with the measuring of coke-oven gas in America; but in this country they have made a name principally through being used by gas undertakings. It would be interesting to know why the coke-oven owners over here have not taken up the rotary meter to a greater extent than has been the case, in view of the favourable reception that has been accorded to it by the same industry in the United States.

# STUDIES IN CARBONIZING.

## IV.—THE PRODUCTION OF WATER GAS IN VERTICAL RETORTS.

By Dr. W. B. Davidson, of Birmingham.

In dealing with this subject, we are treading on difficult and controversial ground. Some gas engineers, notably the advocates of the Dessau system, maintain that great economies are effected by the introduction of steam at the base of the retort during the last portion of the distillation period. Others, again, hold the opinion that, when all costs are included, it is just as cheap to make the water gas in a separate generator, and add it to the coal gas.

In the "Journal für Gasbeleuchtung" for May 7, 1910, there appeared an important contribution to this subject by Herr Debruck, gas engineer, of Düsseldorf, who had made a careful estimate of the actual costs of both methods of working as carried out on his works. [An abstract of this article appeared in the "Journal," May 24, 1910.] The cost of manufacturing 1000 cubic metres of mixed gas from Dessau 4-metre vertical retorts (settings of ten) working with ten-hour charges aided by a separate water-gas plant, was compared with the cost of producing an equal volume of gas by steaming the charges for two hours out of twelve. A large difference was found in favour of the latter method—equal to a gain of 0·84d. per 1000 cubic feet, or 11½d. per ton of coal carbonized. The water gas added was 16 per cent. of the coal gas.

The details of Herr Debruck's calculations may be considered as open to criticism. Converted into English terms of measurement, they are as follows:—

### I.—COAL GAS AND WATER GAS MADE SEPARATELY.

(*a*) Coal Gas Made from Seven Beds of Retorts with Ten-Hour Charges.

*Expenditure.*

| | Per 1000 Cubic Feet. Pence. |
|---|---|
| Interest and depreciation on capital at 6 per cent. | 0·84 |
| Repairs | 0·72 |
| Wages and salaries | 0·69 |
| Coal | 15·02 |
| Coke for retorts | 2·65 |
| Power | 0·11 |
| Total | 20·03 |

*Income.*

| | Pence. |
|---|---|
| Coke | 8·84 |
| Tar | 1·02 |
| Liquor | 1·78 |
| Total | 11·64 |
| Net cost of coal gas | 8·39 |

(*b*) Water Gas.

*Expenditure.*

| | Pence. |
|---|---|
| Interest and depreciation on capital at 6 per cent. | 3·76 |
| Repairs | 0·32 |
| Wages and salaries | 0·72 |
| Coke for generators | 3·65 |
| Coke for boilers | 0·32 |
| Power | 0·72 |
| Total cost of water gas | 9·49 |

(*c*) Cost of Mixture.

| Daily output— | Pence. |
|---|---|
| 1,000,000 cubic feet of coal gas, at 8·39d. per 1000 | 8390 |
| 162,000 ,, ,, of water gas, at 9·49d. ,, ,, | 1537 |
| 1,162,000 cubic feet | 9927 |
| Or 1000 cubic feet of mixed gas | **8·54** |

### II.—MIXTURE OF COAL GAS AND WATER GAS.

Made from 8½ Beds of Retorts with Twelve-Hour Charges and Two Hours' Steaming. Total Production, 1,162,000 Cubic Feet.

*Expenditure.*

| | Per 1000 Cubic Feet. Pence. |
|---|---|
| Interest and depreciation on capital at 6 per cent. | 0·87 |
| Repairs | 0·63 |
| Wages and salaries | 0·60 |
| Coal | 12·92 |
| Coke for retorts | 2·42 |
| Power | 0·10 |
| Total | 17·54 |

*Income.*

| | Pence. |
|---|---|
| Coke | 7·34 |
| Tar | 0·88 |
| Liquor | 1·62 |
| Total | 9·84 |
| Net cost of mixed gas | 7·70 |
| **Saving effected by steaming** | **0·84** |

The high cost of water gas is due, as the author explained, to the large amount charged to interest and depreciation; this being attributable, in the first place, to the fact that the reserve plant at Düsseldorf was very large, and, in the second, to the circumstance that it was required only four months in the year, as against practically full time for the vertical-retort plant. If the minimum water-gas plant could have been used throughout the year, interest and depreciation would have been reduced from 3·76d. to 0·42d., and the cost of water gas would have become 6·15d. per 1000 cubic feet. But even at this much lower rate the separate working would be more expensive; the mixed gas thus produced costing 8·07d., or 0·37d. more than that obtained by the steaming method. This is equivalent to 5·0d. per ton of coal carbonized.

I propose to arrive at the difference in costs in another way. As a preliminary, it is necessary to obtain estimates for the following principal items: (1) Net cost of water gas. (2) Capital charges and maintenance for vertical retorts—settings of eighteen retorts. (3) Additional fuel consumption in steaming. (4) Cost of steam. (5) Carbonizing wages.

1. *Net Cost of Manufacturing Water Gas per* 1000 *Cubic Feet* (*with an Independent Plant*).—This may be arrived at as follows:—

| | Pence. |
|---|---|
| Coke for generators—say, 42 lbs., at 12s. per ton | 2·7 |
| Fuel for boilers ,, 14 ,, ,, 8s. ,, ,, | 0·6 |
| Capital charges and repairs | 0·9 |
| Purification $H_2S$ and 2 per cent. $CO_2$ | 0·7 |
| Wages | 0·7 |
| Total | 5·6 |

Here it is to be noted that it is necessary to reduce the 4 per cent. of $CO_2$ usually present to 2 per cent., before the gas can be used to the same extent as in steaming Dessau retorts. The total charge thus arrived at is corroborated by taking out the cost of making carburetted water gas with the most efficient gas-works plant, making allowances for oil, capital charges, &c.

2. *Capital Charges and Maintenance for Vertical Retorts.*—In the light of recent German publications, and taking due account of somewhat heavier costs in Germany as compared with England, this compound figure may be computed, on the basis of 15 per cent. on capital outlay and 200 days' working per annum, at 20d. for ten-hour charges (settings of eighteen retorts) per ton of coal carbonized. Thus eleven-hour working would cost 22d. per ton of coal, and twelve-hour working 24d.

3. *Additional Fuel Consumption in Steaming.*—It is very difficult to estimate this with certainty, as it is really only a very small amount. In the retort itself, the coke parts with a large proportion of the heat necessary to the water-gas reaction. The writer has observed at the time of coke-discharge reductions in temperature of about 150° Fahr. in the interior of the retorts after two hours' steaming, as compared with twelve hours' distillation without steam. The heat absorbed per 1000 cubic feet of water gas is 68,500 B.Th.U. The coke produced from a ton of coal weighs, let us say, 1500 lbs., and has a specific heat of 0·2. It thus parts with $1500 \times 150 \times 0{\cdot}2 = 45{,}000$ heat units—that is, two-thirds of the necessary quantity. The heat units required to be supplied externally will therefore be—

For 1000 cub. ft. of water gas, $68{,}500 - 45{,}000 = 23{,}500$
,, 2000 ,, ,, ,, $137{,}000 - 45{,}000 = 92{,}000$

The weight of coke theoretically necessary to supply the heat is—

$$\frac{23{,}500}{13{,}000} = 1{\cdot}8 \text{ lbs. for 1000 cub. ft., or } = \frac{92{,}000}{13{,}000}$$

or 7·1 lbs. for 2000 cub. ft.

At 40 per cent. efficiency, the figures will be respectively 4½ lbs. and 18 lbs., costing, at 12s. per ton, 0·29d. and 1·16d. For equal hours of working, it is difficult to see how the extra fuel for two hours' steaming can amount to more than 1 per cent. on the coal carbonized—the figure deduced by Herr Debruck. As far as one can yet judge from practical working on the Birmingham coal-test plant, this allowance is sufficient.

The carbon used up in producing carbon monoxide is readily calculated. It amounts, per 1000 cubic feet of water gas, to 15·6 lbs., which may be valued (at 12s. per ton) at exactly 1d. It is well known that the retort carbon is consumed to a large extent by the admission of steam. As retort carbon fetches about three times the price of coke, it would appear at first sight a disadvantage to consume it in this way. We find, however, that the intervals between "scaling" are doubled by the use of steam (without steam 30 days, with steam 60 days); the retorts being thrown out of action for 24 hours in either case. The saving in capacity of plant thus effected by steaming more than makes up for the loss of retort carbon.

There is naturally an increase in fuel consumption when the distillation period is extended from 10 to 12 hours. An estimate of this increase, based on practical working, as well as on theoretical grounds, may be taken as 1 lb. of coke per 100 lbs. of coal carbonized, costing, at 12s. per ton, 1·4d. per ton of coal distilled. Half this increase may be taken for 11-hour work.

4.—*Cost of Steam.*—At Düsseldorf, no charge was made for fuel for steam raising, as the waste gases from the settings were used

to heat the boiler. Seeing the pressure required is only 5 to 7 lbs. per square inch, exhaust steam can no doubt be employed where available; and, failing this, in most installations the small amount of steam required can be supplied by existing boilers. Theoretically, the quantity of steam necessary for the production of 1000 cubic feet of water gas is through a deep, narrow bed of coke at high temperature; it is 23·4 lbs., or (say) 4 lbs. of boiler fuel at 8s. per ton = 0·17d. Allowing 50 per cent. on this amount for firemen's wages and maintenance, we get the figure 0·25d. Here it is to be remarked that there is no appreciable loss of steam on passing it slowly practically all decomposed. We have been unable to estimate the loss; we only know it is small. In an ordinary water-gas plant, the case is different; there is large wastage of steam.

As already pointed out, the quality of the water gas made in the Dessau retorts is superior to that usually manufactured in an independent plant, especially in respect to carbon dioxide, and hydrocarbons; but it is difficult to make a fair allowance for this. Excluding for the moment capital charges, the cost of 1000 cubic feet of water gas (one hour's steaming) made in Dessau vertical retorts is 0·29 + 1·0 + 0·25 = 1·54d.; while 2000 cubic feet (two hours' steaming) cost 1·16 + 2·0 + 0·50 = 3·66d.

5.—*Carbonizing Wages.*—In comparing the cost of 10-hour with 11 or 12 hour working, it is assumed that carbonizing wages will always be at the same rate per ton of coal carbonized, irrespective of the distillation period. In practice, it is found very awkward and troublesome to work periods that are not exact submultiples of 24. It is also a matter of difficulty to change from one period to another, according as the quality of coals or the retort temperatures vary. A preference must be given to 12-hour charges. The rate, including foremen's wages, for "coal in and coke out" might be taken at the round figure of 6d. per ton of coal carbonized.

This rather uncertain figure may be eliminated by calculating wherever possible on the basis of a ton of coal carbonized. This also has the advantage of excluding residuals. Before proceeding to make comparisons of monetary values, there are certain other considerations to be taken into account. Twelve-hour distillation gives, with richer coals—that is, those that produce gas most suitable for diluting with water gas—about 3 per cent. more heat units than 10-hour work. Poorer coals, that "burn off" more quickly, show a somewhat lower increase. These, however, do not lend themselves to steaming, because the quality of gas they yield is already sufficiently low. The longer period of distillation also ensures an increase, though a very slight one, in the yield of tar and ammonia, for which credit may be taken, to set against a very slight loss in weight (less than 0·4 per cent.) sustained by the coke in parting with a larger amount of volatile matter.

It must be borne in mind that English coals take longer to distil than German coals; and in most cases it is more profitable, with the present capacity of vertical retorts, to work with 12-hour charges. Many rich coals cannot be properly carbonized in 10 or 11 hours.

In the following comparison of costs, it is assumed that 1500 cubic feet of water gas are added for every ton of coal carbonized.

COMPARISON I.—*Vertical Retorts.*

| | Pence per Ton of Coal. |
|---|---|
| (*a*) Conditions: 10-hour charges, without steaming; water gas made in independent plant— | |
| Cost of 1500 cubic feet of water gas, at 5·6d. per 1000. | 8·4 |
| (*b*) Conditions: 12-hour charges, without steaming; water gas made in independent plant— | |
| Cost of 1500 cubic feet of water gas | 8·4 |
| Cost of additional fuel for retorts | 1·4 |
| | 9·8 |
| (*c*) Conditions: 12-hour charges, with steaming— | |
| Cost of 1500 cubic feet of water gas | 2·6 |
| Cost of additional fuel for retorts | 1·4 |
| | 4·0 |
| Difference in favour of (*c*) over (*a*) | 4·4 |
| ,, ,, (*c*) ,, (*b*) | 5·8 |

COMPARISON II.—*Vertical Retorts.*

[Standard gas, 500 B.Th.U. per cubic foot.]

| | Pence per Ton of Coal. |
|---|---|
| (*a*) Conditions: 12-hour charges, without steaming, but with "overpulling" to reduce quality of gas— | |
| 12,700 cubic feet of 500 B.Th.U., at 10d. per 1000. [Note.—100 cubic feet extra allowed for "overpulling."] | 127·0 |
| (*b*) Conditions: 12-hour charges, with steaming— | |
| Coal gas, 12,000 cubic feet, of 525 B.Th.U. | |
| Water gas, 1,500 ,, ,, ,, 300 ,, | |
| Total . . 13,500 cubic feet, of 500 B.Th.U. at 10d.. | 135·0 |
| Add reduced cost of manufacture over (*b*), 800 cubic feet, at 2·5d. (capital charges + wages) per 1000 cubic feet | 2·0 |
| | 137·0 |
| Deduct cost of 1500 cubic feet of water gas | 2·6 |
| Total | 134·4 |
| Difference in favour of (*b*) | 7·4 |

The following record of some practical results obtained with (1) ordinary Derbyshire coal, (2) good Derbyshire coal, and (3) Yorkshire coal, serves to show the advantages derived from steaming good coals:—

| (1) | Make per Ton. Cubic Feet. | I.P. No. 2. | C.V. B.Th.U. | C.V. Multiple. | |
|---|---|---|---|---|---|
| Horizontals, 6 hours | 12,010 | 17·90 | 525 | 6300 | |
| Do., with overpulling | 12,680 | 14·95 | 502 | 6370 | |
| Verticals, 12 hours. | 12,230 | 14·90 | 496 | 6070 | |
| Do., with one hour steaming | 13,530 | 13·35 | 472 | 6390 | |
| (2) | | | | | |
| Horizontals, 6 hours | 11,870 | 19·10 | 543 | 6440 | Difference +7·8p. |
| Verticals, 12 hours, with two hours' steaming | 13,940 | 14·20 | 498 | 6940 | |
| (3) | | | | | |
| Horizontals, 6 hours | 12,040 | 19·60 | 546 | 6570 | Difference +6·2p. ct. |
| Verticals, 12 hours, with two hours' steaming | 14,010 | 15·20 | 498 | 6980 | |

Other advantages of reducing the quality of coal gas wherever practicable by means of water gas produced in the retorts, as compared with water gas from an outside source, in addition to those indicated above, are:

1.—Greater convenience of control of quantity and quality.
2.—Better mixing and greater uniformity of gas.
3.—Prevention of overheating of retorts.
4.—Utilization of the best temperature conditions.

Making a comparison with the low-grade gas made from horizontal retorts by the addition of furnace gases or air, we find the Dessau mixed gas superior, in that it possesses a much lower specific gravity. The use of steam, moreover, does not appear to affect the density of the gas to a prejudicial extent, as the following tests prove:—

| | Coal No. 1. | Coal No. 2. |
|---|---|---|
| Eleven-hour charges with no steam | 0·418 | 0·442 |
| Do., with one hour steam | 0·430 | 0·447 |
| Twelve-hour charges with no steam | 0·422 | 0·408 |
| Do., with one hour steam | 0·434 | 0·410 |

It is very important, in the distribution of gas, that the specific gravity should not increase as the quality undergoes reduction; but unfortunately this is just what happens with gas diluted with nitrogen or carbon dioxide. It is no uncommon thing to find a specific gravity one day of (say) ·45 with ·55 the next, when "overpulling" is the order of the day.

## THE GAS-ENGINE IN PRINCIPLE AND PRACTICE.

THE author of a work bearing the above title which has lately been published,* is to be congratulated on producing a book which is likely to be of considerable service to the class of reader to whom it is especially addressed. It is not ambitious in size or scope; but it is what it claims to be, and that is, suitable for the non-technical reader. The reviewer has found within its pages a great deal of useful explanatory subject-matter, in which much information is imparted to the reader in a manner so clear and concise as to enable him readily to grasp its meaning. The expert so often makes the fatal mistake of writing far above his readers, leaving them perplexed and disheartened, that it is a pleasure to come across a book which adequately fulfils its object.

The volume contains 195 pages, and is divided into nine chapters. Slight reference only is made to the theoretical side of the subject; while historical matters are virtually excluded. No special knowledge of mathematics is required to enable the reader to understand any of the simple calculations included. Lengthy descriptions of the many different types of engines find no place in its pages. Space is rather devoted to descriptions of valves and valve motions, governors, igniters, self-starters, and details of this sort. A special feature is an excellent comparison of the four-cycle and two-cycle types of engines, illustrated by a set of diagrams which give the reader a very good idea of the subject. Another chapter in which the author is at his best is that on "testing," wherein the various instruments in use are described, and the deductions to be drawn from the results clearly explained. The diligent reader will have no trouble in getting from the author's explanations a comprehensive grasp of the proper methods to employ in testing. The illustrations and diagrams are throughout well thought-out, and fulfil their purpose admirably.

Another feature of the work is the author's allusions to methods of utilizing the waste heat from gas-engines. When it is considered that only about 25 per cent. of the heat energy of the fuel is actually converted into work, as compared with about 70 per cent. either lost in the water-jackets of the cylinder or in the exhaust gases, it becomes clear that this question is deserving of much attention. The author shows a method by which much of the waste heat can be used for heating air or water.

A few faults could be mentioned; but they are of trifling importance only, and in no way detract from the value of the book, which is well suited to a larger circle of readers than would be the case had it dealt with the subject from a more advanced standpoint. As it is, it may be recommended to the student, the gas-engine user, the practical workman, and to all but the expert.

* "The Gas Engine in Principle and Practice. By A. H. Goldingham. London: E. and F. N. Spon, Limited. [6s. 6d. net.]

# THE QUALITY OF LONDON GAS

## In the First Quarter of 1912.

In accordance with our usual practice, we give below tables containing a summary of the results of testings of the gas supplied by the three Metropolitan Gas Companies during the first quarter of the year—*i.e.*, the thirteen weeks ended March 30. The figures are compiled from the weekly returns issued by the London County Council; and the corresponding figures for last year will be found in the article on "The Quality of London Gas" in the "JOURNAL" for Feb. 6 last, p. 351 [*cf.* also p. 422 of the issue dated Feb. 13], and in the earlier numbers to which references are given in that article. The figures for the past quarter are especially interesting because they reveal the extent to which the quality of the gas supplied in the Metropolis was affected by the miners' strike. Reference is made to this matter towards the close of this article.

### ILLUMINATING POWER.

The average results of the testings of illuminating power with the standard No. 2 "Metropolitan" argand and with the prescribed flat-flame burner for each Company are shown in Table I. for the

TABLE I.—*Averages of all the Testings of Illuminating Power for the First Quarter of the Year* [*Candles*].

| Company. | No. 2 "Metropolitan" Argand. | | | Flat-Flame. | | |
|---|---|---|---|---|---|---|
| | 1910. | 1911. | 1912. | 1910. | 1911. | 1912. |
| Gaslight and Coke Company . . . | 15·40 | 14·77 | 14·60 | 9·56 | 8·42 | 8·20 |
| South Metropolitan Gas Company . . | 15·86 | 15·57 | 15·48 | 10·08 | 9·67 | 9·45 |
| Commercial Gas Company . . . | 14·47 | 14·57 | 14·81 | 8·48 | 8·48 | 8·28 |

past quarter and for the corresponding quarter of the two preceding years. It will be seen that there has been a slight fall in the average illuminating power of the gas supplied by the Gaslight and Coke Company and the South Metropolitan Company as compared with the corresponding quarter of last year; but there has been a rise in the average illuminating power of the supply of the Commercial Company. The minimum results for the quarter with the testings with the argand burner were: For the Gaslight and Coke Company, 12·67 candles; for the South Metropolitan Company, 14·01 candles; and for the Commercial Company, 12·86 candles. The latter minimum refers to the week ending Jan. 27, and may therefore be regarded as not directly due to the difficulties caused by the miners' strike. But the *minima* in the case of the other two Companies both occurred in the last six weeks of the quarter, and will be again referred to later. The *minima* in the first seven weeks of the quarter were: For the Gaslight and Coke Company 13·52 candles, and for the South Metropolitan Company 14·02 candles. It will be recalled that the Companies are liable to incur a forfeiture if the illuminating power of the gas supplied on the average of three consecutive days' testings falls below 13½ candles. It will be seen therefore that during the first seven weeks of the quarter these two Companies amply fulfilled their statutory obligation in respect of illuminating power. The minimum results obtained with the flat-flame burner during the quarter were: For the Gaslight and Coke Company, 6·85 candles; for the South Metropolitan Company, 7·74 candles; and for the Commercial Company, 7·03 candles. All these *minima* occurred in the first half of the quarter.

### CALORIFIC POWER.

Table II. gives a summary of the results of the testings of calorific power of the gas supplied by each Company during the quarter and the corresponding quarter of each of the two preceding years. It will be seen that the average calorific power for

TABLE II.—*Summary of Testings of Calorific Power (Gross and Net) for the First Quarter of the Year* [*Calories per Cubic Foot*].

| Company. | Average. | | | Maximum. | | | Minimum. | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1910. | 1911. | 1912. | 1910. | 1911. | 1912. | 1910. | 1911. | 1912. |
| Gaslight and Coke— | | | | | | | | | |
| Gross . . . . | 139·7 | 137·8 | 135·1 | 154·8 | 150·0 | 148·6 | 126·6 | 130·8 | 124·0 |
| Net . . . . | 124·3 | 122·8 | 120·5 | 138·2 | 133·7 | 132·8 | 112·6 | 116·1 | 112·2 |
| South Metropolitan— | | | | | | | | | |
| Gross . . . . | 147·3 | 145·3 | 143·2 | 157·8 | 155·2 | 153·9 | 135·9 | 134·9 | 132·4 |
| Net . . . . | 130·9 | 129·4 | 127·5 | 140·9 | 138·8 | 138·3 | 120·8 | 120·8 | 118·6 |
| Commercial— | | | | | | | | | |
| Gross . . . . | 137·9 | 139·0 | 136·7 | 146·8 | 152·2 | 145·5 | 130·2 | 127·8 | 122·0 |
| Net . . . . | 122·7 | 124·0 | 122·3 | 133·1 | 135·8 | 130·6 | 116·1 | 113·8 | 115·3 |

each Company is about 2 calories per cubic foot lower than in the first quarter of 1911. The fall in calorific power occurred for the most part in the second half of the quarter, and may therefore be attributed largely to the difficulties of supply arising from the miners' strike, to which reference will be made later. During the first seven weeks of the quarter, the minimum calorific power was in all cases above the value of 112½ calories net per cubic foot, below which the Gaslight and Coke Company may not allow their gas to fall on the average of three consecutive days' testings without risk of incurring a forfeiture. It will be seen therefore that during the portion of the quarter not directly affected by the miners' strike the calorific power of the gas supplied by the three Companies was well above the standard fixed in the 1909 Act of the Gaslight and Coke Company. [The other two Metropolitan Companies are under no statutory obligations in respect of the calorific power of the gas supplied by them.]

### SULPHUR.

The average and maximum results of the testings of the amount of sulphur contained in the gas supplied by the three Companies are shown in Table III. for the first quarter of the three years.

TABLE III.—*Summary of Testings of the Sulphur in London Gas for the First Quarter of the Year* [*Grains per 100 Cubic Feet*].

| Company. | Average. | | | Maximum. | | |
|---|---|---|---|---|---|---|
| | 1910 | 1911. | 1912. | 1910. | 1911. | 1912. |
| Gaslight and Coke Company . . . | 34·9 | 34·3 | 32·9 | 68·5 | 62·9 | 49·7 |
| South Metropolitan Gas Company . | 36·2 | 29·2 | 23·4 | 70·7 | 57·9 | 47·5 |
| Commercial Gas Company . . . | 29·5 | 30·5 | 25·3 | 43·2 | 56·1 | 43·3 |

It will be noticed that the average amount of sulphur present in the gas shows a marked fall in the past quarter compared with the corresponding quarter of 1911; the fall being greatest in the case of the South Metropolitan Company. The maximum results for each Company are also appreciably lower. If the miners' strike has had any effect on the amount of sulphur in the gas, it has been in the direction of a slight reduction.

### EFFECT OF THE MINERS' STRIKE.

Low returns of illuminating and calorific power occurred chiefly in respect of the gas of the Gaslight and Coke Company from the week ending Feb. 24 up to the end of the quarter, There is little doubt that these low returns are to be attributed to the falling off in the normal supplies of coal due to the miners' strike, and to the necessity for obtaining the largest possible make of gas, irrespective of the maintenance of high quality, from the stocks of coal in hand. The average and minimum of the returns of the illuminating power of the gas in the argand burner, and of the net calorific power are shown for each of the last six weeks of the quarter in Table IV. for the three Companies [p. 216]. It appears that the average results for the supplies of the South Metropolitan and the Commercial Companies during these six weeks were substantially identical with the averages for the whole quarter, so that it may be said that the supplies of these two Companies were practically unaffected in respect of quality by the miners' strike up to the 30th ult. The gas supplied by the Gaslight and Coke Company, on the other hand, showed a distinct falling off both in illuminating power and calorific value in the period affected by the strike. In each week there was a return of illuminating power below 13½ candles, and in three of the weeks below 13 candles. In normal conditions the latter results would forthwith render the Company liable to forfeiture; and the results between 13 and 13½ candles, if maintained as the average of three consecutive days' testings, would also render the Company liable to incur forfeitures. The low returns occurred at more than one testing-place—*e.g*, in the week ending Feb. 24 returns between 13 and 13½ candles occurred at two testing-places; in the week ending March 2, returns between 13 and 13½ candles occurred at two testing-places; in the week ending March 9, returns between 13 and 13½ candles occurred at two testing-places, and below 13 candles at one testing place; in the week ending March 16, returns between 13 and 13½ candles occurred at two testing-places, and below 13 candles at one testing-place; in the week ending March 23, returns between 13 and 13½ candles occurred at two testing-places; and in the week ending March 30, returns between 13 and 13½ candles occurred at four testing-places, and below 13 candles at one testing-place.

The weekly returns issued by the London County Council do not, however, disclose on how many occasions in one week in which a deficiency is reported at a testing-place there have been other deficiencies of a less extent than the one reported. But it is evident, from the foregoing statement, that it was only at five out of the eleven testing-places for the Gaslight and Coke Company that deficiencies were reported in any one week. Consequently, it would appear that, in addition to maintaining an adequate supply of gas during the period affected by the miners' strike, the Company succeeded in maintaining the statutory illuminating power over the greater part of their district. The deficiencies reported will not, as a fact, render the Company liable to forfeiture, because of the saving clause in section 17 of the 1880 Act, and similar clauses in other Acts, to the effect that no forfeiture shall be incurred in any case in respect to which it is certified by the Chief Gas Examiner that the defect was occasioned by an unavoidable cause or accident. It is self-evident that the Gaslight and Coke Company were at the mercy of the miners, or

TABLE IV.—*Summary of Testings of Quality during Six Weeks Affected by the Miners' Strike.*

| Week Ending | Gaslight and Coke Company. | | | | South Metropolitan Company. | | | | Commercial Company. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ill. Power (Argand). Candles. | | Net Calorific Power. Calories. | | Ill. Power (Argand). Candles. | | Net Calorific Power. Calories. | | Ill. Power (Argand). Candles. | | Net Calorific Power. Calories. | |
| | Average. | Minimum. | Average. | Minimum. | Average. | Minimum. | Average. | Minimum. | Average. | Minimum. | Average. | Minimum. |
| Feb. 24, 1912 . . | 14·64 | 13·14 | 120·1 | 113·1 | 15·43 | 14·01 | 127·9 | 119·5 | 14·60 | 13·99 | 121·4 | 115·3 |
| Mar. 2, ,, . . | 14·48 | 13·22 | 118·7 | 112·2 | 15·59 | 14·13 | 127·8 | 121·4 | 14·85 | 14·31 | 121·9 | 117·9 |
| ,, 9, ,, . . | 14·27 | 12·67 | 118·0 | 112·7 | 15·35 | 14·13 | 127·5 | 120·2 | 14·90 | 14·31 | 122·2 | 119·4 |
| ,, 16, ,, . . | 14·36 | 12·78 | 118·1 | 112·6 | 15·34 | 14·09 | 126·9 | 119·3 | 14·89 | 14·17 | 124·5 | 117·5 |
| ,, 23, ,, . . | 14·43 | 13·08 | 118·3 | 113·0 | 15·23 | 14·32 | 127·2 | 120·1 | 15·10 | 14·14 | 122·7 | 116·3 |
| ,, 30, ,, . . | 14·28 | 12·82 | 117·1 | 112·6 | 15·25 | 14·05 | 125·6 | 118·6 | 14·96 | 14·22 | 121·5 | 119·0 |
| Aver. and minimum | 14·41 | 12·67 | 118·4 | 112·2 | 15·365 | 14·01 | 127·15 | 118·6 | 14·88 | 13·99 | 122·4 | 115·3 |

rather miners' leaders; and the cause of the deficiencies reported was therefore unavoidable by the Company.

The net calorific power of the gas supplied by the Gaslight and Coke Company is required to be not less than 112½ calories per cubic foot on the average of three consecutive days' testings. During the period affected by the miners' strike, only at one testing-place and in one week did the minimum return of net calorific power fall below this limit—viz., 112·2 calories at one testing-place in the week ending March 2. Even if this return, taken in conjunction with results on the preceding and following days, sufficed to give an average below 112½ calories, the Company would, of course, be exonerated by the provision in their 1909 Act, that no forfeiture is to be incurred when the defect of calorific power is occasioned by unavoidable cause or accident. It is noteworthy that, despite the cases of deficiency of illuminating power already referred to, the calorific power of the Company's gas was maintained, with one possible exception, throughout the period affected by the miners' strike above the statutory requirements in respect of calorific power.

It will be seen, therefore, from the foregoing that the quality of the gas supplied to the Metropolis has not in any case and in any respect fallen seriously below the prescribed standards, notwithstanding the very great difficulties of working to which the Gas Companies were put by the strike of the miners. To what extent the working has been affected by the increase in the consumption of gas due to the holding-up of domestic coal supplies will probably not be generally known until the reports of the Companies for the half year are issued. It is clear, however, that the consumers of gas in London are to be congratulated on the exemplary manner in which the Metropolitan Gas Companies have succeeded in meeting the difficulties of manufacture and supply which the action of the miners' leaders imposed.

## GAS AT BINGLEY HALL.

THERE is a good opportunity offered annually in Birmingham for calling public attention to the advantages of gas in its manifold uses, in connection with the National Trades Exhibition, which usually remains open for about two months, commencing towards the end of March. The exhibition takes place in the Bingley Hall—a large structure which is centrally situated and in every way eminently suitable for such a purpose. The exhibits are of a miscellaneous character, and the strictly "entertainment" side is not forgotten. The musical programme includes performances by some of the best of the military bands; so that there is everything calculated to make the show a popular one. Each year, in fact, the exhibition progresses in extent and attractiveness; and it is gratifying to note that the gas portion of it manifests a like tendency.

On the present occasion, there is again a good and representative display of high-pressure lighting, which has been arranged by Mr. S. R. Barrett, the Fittings Superintendent of the Birmingham Corporation Gas Department. Placed around the galleries there are a number of Brimsdown (Pintsch) high-pressure 300-candle power lamps, having a consumption of 6 cubic feet of gas per hour. These are intended for inside factory, &c., lighting; and they are found to be good, hard working lamps, costing little for replacements. Among the large high-pressure lamps in operation were particularly noticed the Keith, the "Ukay" (made by Messrs. Joseph Breedon and Sons, of Birmingham), the Brimsdown (Pintsch), and the "Pharos-Welsbach;" but doubtless others were also included. All the lamps do good work; and, in connection with this point, an expression of opinion was heard to the effect that, as between English made and foreign made high-pressure lamps, it requires an expert eye to tell which is which. The lamps in the exhibition are not fitted with glasses, because it is unnecessary; but wire screens are provided, to prevent any possibility of accident. The difficulty of the fusion of the nozzles, it is pointed out, has now been met. In the case of the "Pharos-Welsbach" lamp, for instance, a special metal is used for the nozzle which is capable of resisting any temperature to which the burner is likely to be subjected. The high-pressure gas supply for the exhibition is supplied direct from the Corporation high-pressure main; and it is all controlled by a Keith governor, which works most satisfactorily. The total consumption amounts to about 1500 cubic feet per hour; and the simplicity of the whole arrangement is demonstrated by the fact that by the mere turning of a tap, the whole of the exhibition is lit up. The pressure on the main varies from 12 lbs. in the day-time to 7 lbs. after industrial working hours; and this is broken-down in the hall to 70 inches of water. The item of mantle maintenance in connection with the exhibition is, we learn, not worth consideration.

Different stands are, of course, lighted by special systems; and the Corporation's own exhibit is surrounded by a row of small high-pressure "Ovee" lamps, of about 60-candle power, with a consumption of something like 1¼ cubic feet of gas each per hour. The lights are fitted with attractive bead shades—green and gold alternately—and, in addition to providing an excellent illuminating effect, they serve to draw attention to a well-assorted display of up-to-date gas appliances. The stand itself is divided into two sections—one devoted to the domestic and the other to the industrial uses of gas. The things to be seen there (as well as on the other stands in the exhibition) are too varied to be detailed here. On the domestic side of the stand, there is included a tiny Marsh rotary meter, called the "taxi" meter, applicable to hotels, lodging-houses, &c., and registering the cash amount due for the gas consumed. It is particularly intended to be employed in connection with gas-fires that are occasionally in use. The progress that is being made by gas flash-signs, both for external and internal use, is illustrated by several of these devices in operation, on the Richmond Gas Stove and Meter Company's and the F.O.S. systems. Interest is aroused by one of Messrs. Thomas Glover and Co.'s coin-counters; and an outstanding feature of the stall is an exceedingly handsome dog-grate gas-fire, in a tiled recess, with a massive chimney-piece. This is suitable for a large room; and it is one of Messrs. John Wright and Co.'s new patterns, called the "Kenilworth." The possibilities of low-pressure gas lighting are fully demonstrated; and there are on view several systems of water-heating by gas—including the Wilsons and Mathieson, John Wright and Co., Davis Gas-Stove Company, and the Parkinson Stove Company. Dry gas-meters, both ordinary and prepayment, of Messrs. Parkinson and W. & B. Cowan's and Messrs. George Glover and Co.'s makes, are to be seen. On the other side of the stand, there is a large selection of the latest appliances employed in industrial processes in Birmingham, embracing brass-melting furnaces, cupro-nickel melting furnaces, forging furnaces, high-pressure blow-pipes, high and low pressure annealing ovens, high-pressure soldering irons, &c.—some of them being shown under working conditions. In connection with this branch of gas supply, it may be remarked that on a resumption of the normal condition of affairs in Birmingham, considerable alacrity was shown in returning from the use of coke to high-pressure gas for the melting of metals. In one large foundry where electric motors and fans were put down to heat the coke by blast, immediately on the high-pressure supply becoming again available there was a turn over to gas. Many workmen having got accustomed to the gas-furnaces felt quite depressed by the silence that prevailed when coke firing was reverted to, and heartily welcomed the return to the more noisy conditions of high-pressure gas-furnaces.

Turning to the other stands, it may be stated that Messrs. R. & A. Main and Thomas Glover and Co. make a good show of heating appliances (including a St. Nicholas fire connected up), and "Gothic" street-lanterns and inverted lights with Holophane reflectors. The Parkinson Stove Company exhibit their cooking and heating apparatus and Maughan geysers; and their stand is lighted by "Parkinson" inverted burner arc lamps. In addition to many other specialities, Messrs. Fletcher, Russell, and Co. draw attention to their furnaces for different purposes, to work at either high or low pressure. Arrangements are made for demonstrating the uses of these, as is also the case in connection with the exhibit of the Manchester Furnaces, Limited, who show two natural draught low-pressure furnaces, &c. Fires, cookers, water-heaters, and other things are also displayed by the Cannon Iron Foundries, the Carron Company, and Messrs. John Wright and Co. The National Gas-Engine Company are well represented in the direction indicated by their title; and attention is drawn to their suction-gas producer and engine.

**The Wales and Monmouthshire District Institution of Gas Engineers and Managers** will hold their meeting on Thursday, May 9, at Pontypridd. The programme will be announced later.

# TAPLAY'S COMBUSTION GAS ANALYSER.

## AN APPARATUS FOR GAS ANALYSIS BY COMBUSTION OVER COPPER OXIDE.

**Described with Useful Notes and Instructions.**

By J. G. Taplay.

### Preliminary.

A considerable amount of attention has been given recently to the fractional combustion of gas mixtures over heated cupric oxide as a means of determining the volumes of hydrogen, methane, and nitrogen left after absorbing the carbon dioxide, unsaturated hydrocarbons, benzene, oxygen, and carbon monoxide in a sample of coal gas, carburetted water gas, or other combustible gas mixture. Usually the volumes of hydrogen, methane, and nitrogen, which constitute the "residual" gas are determined by combustion with oxygen or air, or a mixture of both, and measurement of the resulting contraction and of the carbon dioxide produced.

For reasons which are given further on, the writer, taking advantage of the copper oxide method of combustion as applied to organic analysis, constructed during the autumn of 1909, an apparatus, part of which consisted of a tube of hard combustion glass filled with cupric oxide, which, when heated to a red heat, was employed to effect combustion of the hydrogen and methane; the contraction due to the combustion of the hydrogen and the volume of the residual nitrogen being determined by measurement, and the volume of the methane by difference. Within a few weeks, however, owing to the hard combustion glass not being able to withstand the necessary temperature for many combustions, tubes made of clear, fused silica were employed, and have proved very satisfactory—one such tube of silica having been used for over three hundred combustions. It was found that this combustion method gave such consistent and reliable results that it has been used for technical gas analysis down to the present time; and Messrs. Alexander Wright and Co., Limited, have been asked to construct and supply the apparatus under the name of "Taplay's Combustion Gas Analyser."

The purpose of this article is fourfold:

1.—To describe the construction and manipulation of the apparatus for determining the constituents in residual gas by combustion over cupric oxide. By this means, the use of explosion apparatus is avoided.

2.—To describe the application of the apparatus to the determination of the carbon density or value of hydrocarbons ($C_nH_m$). By this means, the calorific value of a gas can be accurately calculated.

3.—To describe the method employed by the writer in using the Bunte burette for the determination of the absorbable constituents. It will be obvious that Hempel's, Orsat's, or other apparatus can be used in conjunction with the combustion apparatus; but the writer, having found many advantages in the Bunte apparatus, ventures to add an explanation of his method of using it and of preparing the solutions.

4.—To describe the application of the apparatus to the determination of ethane in coal mine, natural, or other gas.

### What the Apparatus Does.

This apparatus is used not only for the determination of hydrogen, methane, and nitrogen in gas mixtures, but also for determining the nature of the hydrocarbons absorbable by bromine water—otherwise called the "illuminants" or hydrocarbons of the olefine series. It has also been used for determining the volume of ethane in samples of coal-mine gas.

### Its Advantages Over the Explosion Method.

The experience of the writer and other experimentalists in making explosions of combustible gas with oxygen is that these have been accompanied by the separation of hydrogen, carbon monoxide, and free carbon, due to dissociation of water vapour and carbon dioxide, caused by the high temperature of the explosion; and even formic aldehyde has been found in the combustion products, which should consist solely of carbon dioxide and water. Explosions of gas with air have resulted in finding hydrogen in the products, due to imperfect combustion—all this notwithstanding the gases had been previously well mixed.

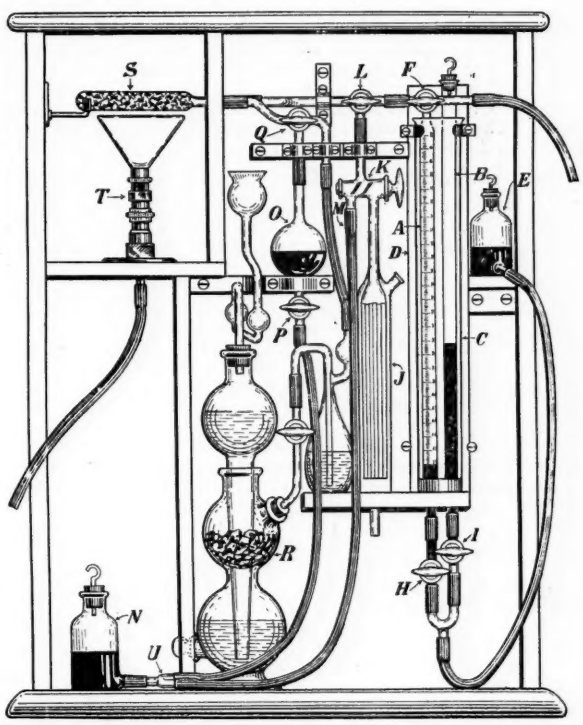
Explosions of this kind would, of course, influence the volumes of the three residual gases. Moreover, the greater the amount of nitrogen in the combustible gas, the more difficult is it to obtain perfect combustion of the hydrogen and methane. Again, perfect combustion of the hydrogen and methane has been attended by a partial combustion of the nitrogen to nitric acid.

It is also well known that the form of the explosion vessel and the quantity of gas taken for explosion have an influence on the combustion of gas mixtures, and that gas mixtures of widely differing composition behave differently in the same explosion vessel. Such conflicting results can be obtained with the same sample of gas that it is impossible to determine which are the correct figures without having recourse to an investigation into the nature of the combustion products; and this must be done with any given type of gas before it is possible to determine the conditions that will give a reliable result, which is, to say the least, a tedious process. By effecting combustion over heated cupric oxide, however, no such complications can arise, and an admixture of oxygen or air is not needed. So that, in addition to being much simpler and quicker, this method sweeps away at once the uncertainties and errors due to the explosion method.

### Description of Taplay's Gas Analyser.

A brief description of the combustion apparatus will not be out of place here. The salient points to be borne in mind are that contact with cupric oxide at a dull red heat oxidizes $H_2$ to $H_2O$, and at a bright red heat oxidizes the paraffins $CH_4$ (and $C_2H_6$, if present) to $CO_2$ and $H_2O$.

In fig. 1, A is the measuring-burette, of 50 c.c. capacity, B the levelling-tube, C the water-jacket, D a plate of opal glass to facilitate the reading of the burette, E a reservoir, F a three-way tap blown on to the burette, G a tap, H and I are taps which are




closed after bringing the gas within the burette to atmospheric pressure. J is a vessel containing potassium hydroxide solution for absorption of carbon dioxide. K is a two-way tap, L a three-way tap. M is a capillary connected by thick-walled rubber tubing to a reservoir N. O is a displacer (capacity about 60 c.c.). P is a tap, Q a three-way tap. R is a Kipp's carbon dioxide generator and washing vessel containing a solution of sodium monocarbonate (coloured with methyl orange to indicate when the solution becomes acid), to free the carbon dioxide from hydrochloric acid vapours. S is the combustion-tube, U-shaped, filled with cupric oxide prepared from copper wire. One end of the U-shaped combustion-tube is connected to the displacer O, and the other end to the three-way tap L, communicating with the vessel J, containing the potassium hydroxide solution, and with the three-way tap F, communicating with the measuring-burette A and with the tap G. T is the gas-burner to heat the combustion-tube. U is a Y-piece connecting the reservoir N to the displacer O and to the capillary jet of the two-way tap K.

Mercury is employed as the confining fluid in the measuring-burette A, in the levelling-tube B, and in the displacer O. Despite statements made to the contrary, the writer is firmly of the opinion that brine is of no use for this purpose, as carbon dioxide is employed to fill the combustion-tube and connections before the combustion of the gas under analysis is commenced; and brine will, under favourable conditions, absorb carbon dioxide, and, under other conditions, the carbon dioxide will be liberated again. Since this is so, it would not be possible to determine the volume of either the hydrogen or the methane in a residual gas if brine is used as the confining fluid.

It should be noted that, though the writer has dealt with this in minute detail, the actual operations will be found to be exceedingly simple, and capable of being rapidly performed by a comparatively unskilled (if careful) assistant.

### Manipulation of the Apparatus.

See that the capillary between the potash vessel J and the tap

K is filled with the potash solution, and that the capillaries from M to tap L, and from O to tap Q, are filled with mercury. Next, turn on the tap of the carbon dioxide generator, also turn the taps Q, L, F, and G in such a manner as to communicate with the atmosphere, and allow the carbon dioxide to sweep out all air from the combustion-tube and connections for a few minutes. While this is being done, light the gas-burner T, and heat the combustion-tube to a low red heat (about 270° C.).

Freshly broken marble has often been found to give off a small quantity of hydrogen. It is therefore advisable to free the carbon dioxide from this hydrogen. To do this, close the tap G, open the tap F to the burette, and, when the tap H is opened, draw about 20 c.c. of the carbon dioxide into the burette, taking care to hold the bottle E near to the surface of the mercury in the burette. Now turn tap Q so that communication is made with the displacer O, and, with the tap P open, pass the carbon dioxide slowly from the burette to the displacer and back again to the burette, *viâ* the combustion-tube; and when the capillary between O and Q is again filled with mercury, close the tap P. Allow a minute or two to elapse, to enable the carbon dioxide in the combustion-tube to become expanded, then bring the volume of gas in the burette to atmospheric pressure, with the assistance of the levelling-tube B and the bottle E. Now close the taps H and I. [This levelling affects the whole of the gas within the combustion-tube and connections as well as that in the burette.] Next turn the tap F, so that communication is made between the gas in the burette and the atmosphere and, with the taps G and H open, discharge the carbon dioxide from the burette into the atmosphere, following up with the mercury. When the burette and capillary to the tap G are filled with mercury, close the taps G and H. The apparatus is now ready for the sample of gas to be taken in and analysed.

### Analysis of Residual Gas—Hydrogen, Methane, & Nitrogen.

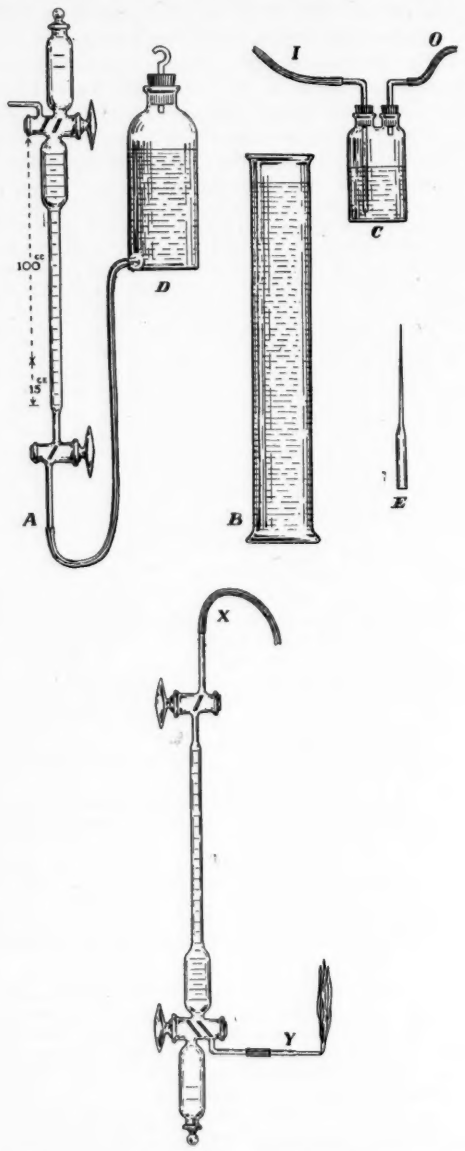
It is assumed that the above residual gas is contained in a Bunte burette. First fill the jet, below the lower tap, with mercury. This can be done either by means of the drawn-out glass tube (fig. E), or by placing mercury in the cup, opening the upper tap and allowing the mercury to fall to the bottom of the burette, then closing this tap, and, lastly, opening the lower tap and allowing the mercury to flow out until only the jet and the bore of the tap are filled. The lower tap is then closed. The burette is now inverted, and the enclosed gas is warmed by the hand to cause expansion. The tap near the cup is turned so as to make communication between the gas in the burette and the jet near the cup. The water in the burette will now be forced out by the expanded gas, and will fill the jet. Now close the tap and connect the jet with the pressure-bottle D by means of the rubber tubing, which must be quite full of water while the connection is being made. Over the jet containing mercury, at the other end of the burette, place a short piece (about 3 inches long) of thick-walled rubber tubing, fill it to the top with mercury, and connect up to the tap G of the combustion-apparatus. This connection is arranged so that one-half of the rubber tube is fixed to the jet of the Bunte burette and the other half to the jet below the tap G.

Open all the necessary taps, and draw the gas from the Bunte burette into the measuring-burette of the combustion-apparatus by means of the bottle E; the pressure-bottle connected to the Bunte burette being at a slightly higher level than the surface of the water in this burette. When sufficient gas has been drawn into the measuring-burette A (say, 40 to 50 c.c.), bring the surfaces of the mercury in the bottle E and the measuring-burette A to approximate atmospheric pressure, then close the tap G, and also those on the Bunte burette. The latter may now be disconnected. It is a good plan to employ about one-half of the volume of residual gas contained in the Bunte burette, in case it becomes necessary to repeat the analysis by combustion.

*Hydrogen.*—The gas in the measuring-burette is now brought to atmospheric pressure with the assistance of the levelling-tube B, and the volume of gas is noted. The taps F, L, and Q are now turned so as to make communication between the measuring-burette A and the displacer O, *viâ* the combustion-tube S. With the tap H slightly opened and the tap P fully opened, pass the gas from the measuring-burette to the displacer and back to the burette. This procedure is repeated once or twice; the gas being finally drawn back into the measuring-burette. When the mercury has filled the capillary between O and the tap Q, close the tap P. Allow a minute or two for the gas in the combustion-tube to expand, then bring the whole volume of gas to atmospheric pressure as before, close the taps H and I, and read the volume, which will now be found to be rather less than one-half of the volume taken for combustion; the contraction being due to the combustion of the hydrogen. The difference between the volume of gas originally measured and that now observed represents the volume of hydrogen contained in the residual gas. The temperature of the combustion of hydrogen by this method is about 270° C. (518° Fahr.).

*Methane and Nitrogen.*—The combustion-tube is now raised to a bright red heat [the temperature of the combustion of methane by this method is about 850° C., or 1562° Fahr.], and the gas is passed slowly backward and forward several times between the measuring-burette and the displacer, in order to effect the combustion of the methane to carbon dioxide and water vapour. Ten minutes will be sufficient for the combustion of the methane, if the volume of nitrogen is low (say, about 6 to 8 per cent.); but if it should be high (say, 12 to 15 per cent.), twenty minutes or half-an-hour is not too long a period for the combustion. After the combustion has taken place, pass the gas back to the measuring-burette, and see that the capillary between O and the tap Q is filled with mercury, and that the tap P is then closed.

Next turn the taps L and K so that the gas can be transferred from the measuring-burette to the caustic potash vessel J, and when the mercury has risen to the tap F, close the two-way tap K. Now turn taps Q and L in such a manner that carbon dioxide can be drawn from the generator, through the combustion-tube and connections, into the measuring-burette, until the total volume of gas is about 50 c.c. In this manner, the carbon dioxide is employed to sweep out the remaining small quantity of nitrogen from the combustion-tube and connections. The whole contents




of the measuring-burette are then transferred to the caustic potash vessel J, followed by the mercury; and when the latter has reached the bottom of the capillary below the tap K, that tap and the tap H are closed.

The gas in the caustic potash vessel J is a mixture of carbon dioxide and nitrogen. The former gas will be absorbed, and the latter will remain unaltered. When the absorption of carbon dioxide is complete, the residual nitrogen is drawn back into the measuring-burette, and the caustic potash solution allowed to fill the capillary between the vessel J and the tap K. The latter tap is then reversed, and mercury from the bottle N is allowed to fill the capillaries between the under side of the tap K and the upper side of the tap F. Taps K and F are then closed, the nitrogen in the measuring-burette is brought under atmospheric pressure, and its volume noted.

If the sum of the volumes of hydrogen and nitrogen be deducted from the total volume of gas taken for combustion, the difference will represent the volume of methane in the quantity of gas taken. If it is thought that the combustion has not been completed, a little carbon dioxide can be drawn into the measuring-burette, which, with the nitrogen, can be passed through the combustion-tube, to ascertain whether any further combustion takes place, or the second half of the residual gas, contained in the Bünte burette can be analysed in the manner described above.

It should be noted, when transferring gas from the measuring

burette to the displacer, and *vice versâ*, that neither too much pressure on the one hand (say, 2 or 3 inches of mercury), nor too much partial vacuum on the other hand (say, ½ inch of mercury), should be employed; and all the taps, (especially taps F, L, and Q) should be well lubricated with the special rubber-grease provided for the purpose.

"ORIGINAL" GAS.

*Determination of the Carbon Density of the Hydrocarbons of the $C_nH_m$ Group.*—The writer stated above that he employed his combustion analyser to make an auxiliary test by which he determines the carbon density of the hydrocarbons of the $C_nH_m$ group. This statement calls for a brief explanation. When gas is subjected to the action of bromine, it is usually assumed that the gas absorbed is ethylene ($C_2H_4$). This is by no means always the case, for the olefines might consist of ethylene ($C_2H_4$) and propylene ($C_3H_6$), and, if very rich, small quantities of butylene ($C_4H_8$). Now, for purposes of analysis, one might just as well be accurate as not, besides which a knowledge of the average composition of these hydrocarbons is of the utmost importance in calculating and checking calorific values. The writer finds no difficulty in getting an agreement between calculated and observed calorific value of 0·5 per cent. By the means now described, this average composition can be readily obtained—it being assumed that the analyst has already made his absorptions of the sample of gas he is examining. The gas taken therefore is that from which none of the constituents have been removed by absorption. The combustion necessary for this determination may, in order to save time, take place while the absorptions are being effected in the Bunte burette. The sample of gas required may conveniently pass through the latter burette, and so to the measuring-burette of the combustion apparatus.

The apparatus is filled with carbon dioxide and the combustion-tube heated to a bright red heat, and the sample of gas drawn into the measuring-burette, and its volume noted—all the operations being carried out as already described for the analysis of the residual gas. About 40 c.c. of the gas will be sufficient for this combustion. In this case, a contraction and an expansion in volume are taking place at the same time—the former, which is the greater in proportion, being due to the combustion of the hydrogen, and the latter to the combustion of the olefines and benzene to carbon dioxide. The olefines will produce anything from two to four times their volume, according to the carbon density of the compound, and benzene will produce six times its volume of carbon dioxide. The combustion is therefore continued so long as an expansion in volume is observed, after the contraction due to the combustion of the hydrogen has taken place. The volume of remaining gas is then brought under atmospheric pressure and noted, and is calculated to percentage volume.

The percentage volumes of the constituents of the gas mixture, or the carbon dioxide equivalents, in the case of carbon monoxide and methane (except that due to the olefines), are then deducted from the above calculated figure—the hydrogen and oxygen being already deducted by combustion; and the residue will represent the percentage volume of carbon dioxide due to the combustion of the olefines. If this volume be divided by the percentage volume of olefines, determined by bromine water in the Bunte burette, the result will give the carbon density of these hydrocarbons. The density of the hydrogen is, for all practical purposes, twice that of the carbon density.

We have, now, all necessary data for the complete analysis of the gas—the calculations are set out after the absorption results obtained by the Bunte burette.

It may be here mentioned that, after the volume of remaining gas left when the combustion of the original gas has been observed, the volume of nitrogen may also be determined. This will act as a check on the amount determined when using the residual gas for the purpose.

NOTE.—It has been proved by experiment, when reading the volume of remaining gas, after the combustion of the hydrogen in the residual gas, or after the combustion when using original gas, that it is not necessary to shut off the gas-burner and cool the apparatus and enclosed gas down to atmospheric temperature; the following results will show this:

| — | Measurements Made after Cooling the Apparatus. | Measurements Made while the Combustion Tube is Heated. |
|---|---|---|
| | Per Cent. | Per Cent. |
| Residual gas . . | Hydrogen . . . = 43·5 | Hydrogen . . . = 43·3 |
| Original gas . . | Remaining volume = 60·04 | Remaining volume = 60·40 |

On the completion of the analysis, the gas-burner is shut off and the outlet from the carbon dioxide generator left open to the combustion-tube. As the latter cools, carbon dioxide will be drawn into it from the generator; and the apparatus will be ready for the next analysis. Occasionally, the small amount of reduced copper in the combustion-tube will require to be re-oxidized. This can be done while the combustion-tube is heated to a bright red heat, by drawing air through the tap G into the displacer O, and discharging it for about six times—afterwards leaving the apparatus filled with carbon dioxide.

*(To be continued.)*

We learn that the Dessau Company have received a repeat order for one bed of twelve 4-metre (13 feet) vertical retorts for Schott and Gen, near Jena.

# A LOCAL TAXATION RETURN.

### The Lighting and Watching Act.

THERE are to be found in Part III. of the Local Taxation Returns for the financial year 1909-10 (which has lately been issued as a Blue-Book) abstracts of returns made by Rural District Councils, Parish Councils, Parish Meetings, Joint Committees appointed wholly by Parish Councils and Parish Meetings, and likewise by Inspectors and Committees under the Lighting and Watching Act, 1833.

At the commencement of the year beginning April 1, 1909, there were 665 rural district councils in England and Wales; and their receipts (exclusive of borrowed money) amounted in the aggregate to £4,584,143. Of this, £3,229,807 was from rates, and £351,851 under the Agricultural Rates Act. From water-works, there was a revenue of £186,266; and various other items made up the balance. A sum of £1350 was received from an electric lighting undertaking, and £925 from gas-works. The total receipts, compared with the previous year, show an increase of £105,252. Expenditure not defrayed out of loans was £4,571,923, and included £181,667 for water-works, £1418 for electric lighting (excluding the cost of public electric lighting), and £782 for gas-works. The outlay on public lighting was: Electric lighting, £3072; other lighting, £21,195. The total outgoings were £80,939 more than the year before. At the commencement of the year under review, the aggregate length of roads under the supervision of the rural district councils was 101,365 miles. The receipts from loans in the year 1909-10 totalled £489,420, of which £134,815 was for water-works purposes; and the expenditure out of loans was £510,100, of which £142,573 was for water-works, and £1210 for electric lighting. The total outstanding loans on March 31, 1910, were £6,121,518; the figures for water-works being £1,808,661, for electric lighting £23,983, for gas-works £3119, and for public lighting £647. The assessable value of districts for the purpose of assessment for general expenses was £44,927,180; and for special expenses of contributory places in which rates for such expenses were levied, £22,879,489. The population of the districts according to the 1901 census was 7,202,467. The loan charges, for interest and for the repayment of capital, amounted to the total of £515,639.

During the year ended March, 1910, there were 7245 rural parishes entitled to parish councils, and 5678 other rural parishes. But only 6468 parish councils had financial transactions during the year, and 379 parish meetings. Rates to meet general expenses were raised for 3303 parish councils, and for the parish meetings of 140 parishes not having parish councils. Under the Lighting and Watching Act of 1833, rates were raised for 914 parish councils, and five parish meetings. The actual number of parish councils having transactions under this Act was 977. The total receipts under the Act were £81,750; and the expenditure, including loan charges, was £80,674. In 26 parishes or lighting districts the Act was administered by inspectors or joint committees; and in these cases, the receipts amounted to £2690, and the expenditure to £2586—in addition to the amounts already mentioned. The rates raised under the Act by parish councils or parish meetings, in respect of buildings and other hereditaments not being agricultural land, amounted to 3d. or under in 605 cases, over 3d. but not more than 9d. in 308 cases, and more than 9d. in six cases. The total amount of the loans outstanding at the end of the year under review, for the councils and the parish meetings, was £233,732, of which £600 was for public lighting other than electric lighting, and £656 for public electric lighting. Of the 26 parishes or lighting districts in which the Lighting and Watching Act was administered by inspectors or joint committees, in twenty cases lighting inspectors were appointed under the Act, while in the remaining six there were joint committees appointed under the Local Government Act of 1894 to exercise the powers of lighting inspectors in areas comprised in more than one rural parish. The lighting rates made during the year in respect of houses, buildings, &c., in these districts, varied from 3¾d. to 9d. in the pound; the rates levied in respect of land being in all cases one-third as much. Adding the amounts involved in these districts to the sums received and paid under the Act during the year by parish councils and parish meetings, the total receipts amount to £84,440, and the expenditure to £83,260.

**Gas for Firing Pottery.**—At a recent meeting of the English Ceramic Society, Mr. J. King, of the Richmond Gas-Stove and Meter Company, Limited, gave a demonstration of, and read a paper dealing with, the Company's gas-heated muffle furnaces and their relative uses for the firing of pottery. Both proved interesting to the Society, the President of which (Mr. R. Shenton) occupied the chair. It is anticipated that, in the near future, gas as a fuel will play an important part in the production of high-class work in the pottery industry, especially having regard to the delicate nature of the process of firing the ware. Owing to the absolute cleanliness and the ease with which the heats can be controlled and kept to the temperatures which are so essential in connection with pottery kiln work, sufficient interest has been aroused to justify the belief that there are in the future great possibilities for gas-heated muffles for employment in certain classes of kiln work, such as firing colours, &c.

# NEW LAMP SUSPENSION GEAR.

On the occasion of the recent visit of the London and Southern District Junior Gas Association to the Holloway works of the James Keith and Blackman Company, Limited, brief reference was made to the firm's new patent raising and lowering gear for lamps attached to brackets or ceilings or swan-necks on columns, and to their patent raising and lowering method combined with traversing gear for central suspension. An outstanding feature of this system is that the difficulty is entirely overcome of having to make use of flexible tubes (with their attendant disadvantages in the matters of condensation, kinking, &c.) to convey the gas—a metallic pipe being substituted. The further particulars, and the illustrations, which it is now possible to give, will fully explain the nature of the inventions.

## Keith Patent Traversing Gear.

In place of a flexible tube, a metallic pipe A (fig. 1), of ample dimensions, is carried by the suspending rope B to the point from which the lamp normally hangs, and permanently connected by a ball-coupling to a "hanger" C, also suspended from the rope. The lamp is suspended from a carriage D, which is traversed inwards and outwards by means of the usual double winch. A special form of cup-and-ball joint is arranged; the ball half E being fixed to the hanger, and an inverted cup F being fixed to a form of stirrup-piece G attached to the top of the lamp. The joint is so arranged that it takes the weight of the lamp when shipped into position, independent of the supporting wire rope H. This ensures a tight joint, and at the same time affords a safety-catch for the lamp, and besides relieves the running wire-rope of the weight.

To unship the lamp, the winding-drum is turned so as to raise the cup off the ball, and clear of the safety-guide J; and the carriage, with the lamp, can then be traversed inwards towards the pavement and lowered (see fig. 2). When in the lowered position, if a supply of gas is required, this may be secured temporarily by means of a flexible tube, one end of which is connected by a simple form of coupling to the cup F on the lamp, and the other end to a supply in the box containing the control-cock of the lamp. Between the stirrup-piece and the lamp is fixed a special automatic lighter K, which controls the bye-pass arrangements in such a way that while there is low pressure in the supply-pipe the gas is cut off from the burner and diverted to the pilot-light in the lamp. When the full pressure is admitted to the service-pipe, the main valve to the burner is opened automatically; and the pilot-light, while giving a temporary flash during the rising of the pressure, is eventually cut down to such a size as will just ensure that the bye-pass tube remains charged with gas. Upon disconnecting the lamp from the supply, the bye-pass is, of course, extinguished; but provision is made for re-lighting this by attaching a small tube L fitted with an asbestos wick to the bye-pass protector M. Before raising the lamp, this tube is charged with methylated spirit or paraffin, and lit; so that when the lamp is put into its position, the pilot supply is relit from it.

As the supply-pipe between the wall and the hanger is attached to the rope, it naturally has a sag towards the hanger. In order to overcome the difficulty of condensation in the supply-pipe, the lower part of the hanger is formed with a chamber, which acts as a trap, and the lower part of the chamber is fitted with a small ground cock with a bell-crank lever N. A pin O on the traversing carriage is arranged to engage with the bell-crank on the cock, and open it whenever the carriage is moved inwards towards the wall, and close it when it is moved outwards to a stop in the normal

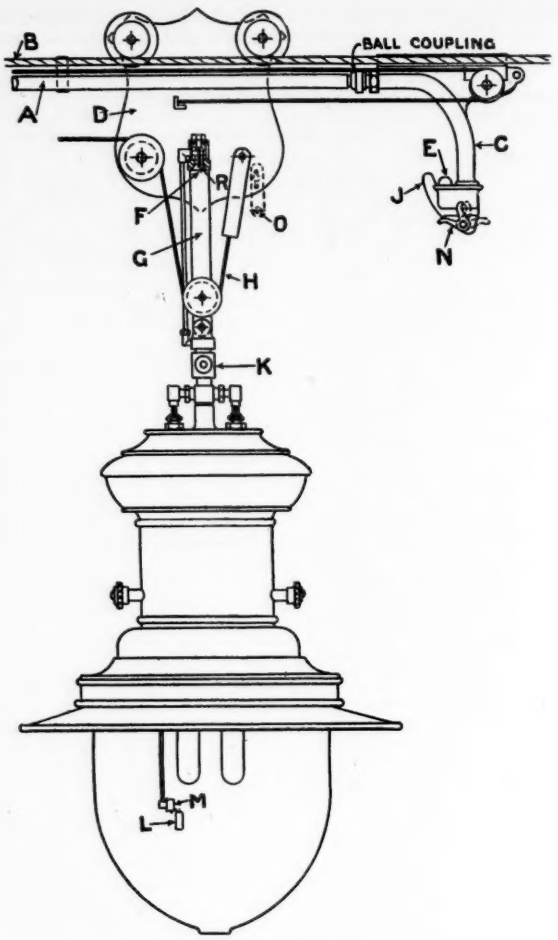



Fig. 1.—Gear for Central Suspension.

position. This gives a very positive action; and by its use any condensation may be discharged from the chamber without disconnecting the lamp from the supply, even though the lamp may be alight.

In order to prevent any escape of gas while the lamp is unshipped, a spherical valve is arranged inside the ball E. It is held open by a pin R when the lamp is in position, but is closed by a spring when the lamp is removed.

## Keith Patent Gear for Raising and Lowering Lamps Attached to Brackets or Ceilings or Swan-Necks on Columns.

This arrangement again dispenses with the use of flexible tubing, and enables a sound joint to be made, while still allowing the lamp freedom to swing as on a ball-joint. The gas-joint is made in the same manner as in the case of the traversing gear; but the lamp is raised and lowered by a single winch. In this case, however,

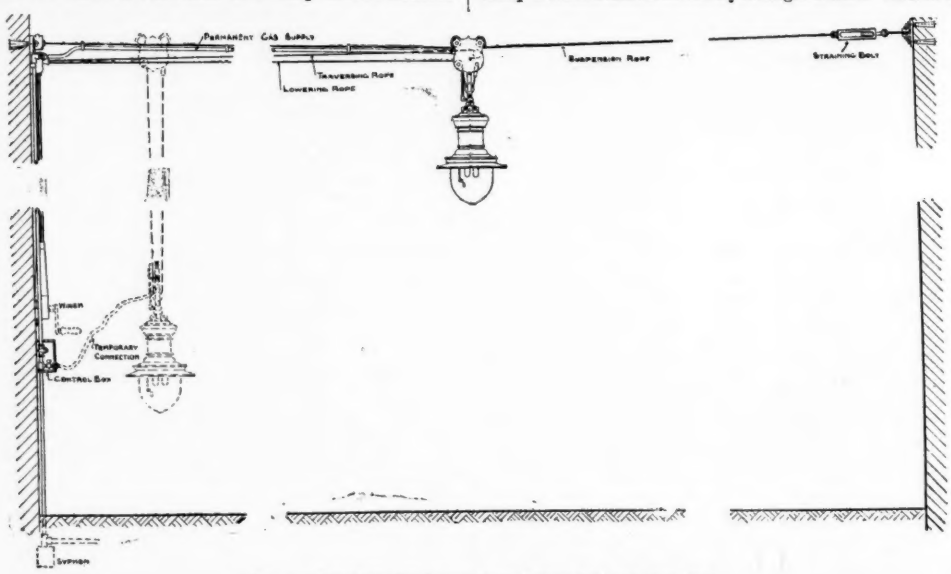



Fig. 2.—Showing the Lamp both Suspended and Lowered.

provision has to be made to enable the lamp to be raised and lowered without the use of the traversing arrangement; and this entails adding a pair of levers S (fig. 3) to the stirrup-piece.

When the lamp is raised, the cup on the stirrup-piece comes in contact with an inclined prong P on the lower part of the hanger, which pushes it out of the centre as it is raised. On being raised above the prong, the cup swings inwards to the centre exactly over the ball; so that, upon being lowered, it will drop on the ball, and make a gas-tight joint by its own weight. To lower the lamp, it is first raised until the ends of the two levers engage with

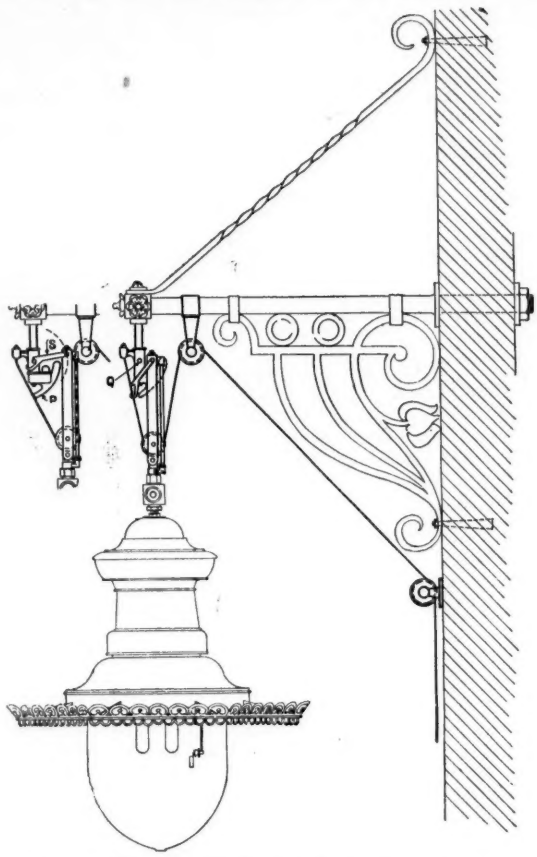


**Fig. 3.—Raising and Lowering Gear for Brackets, Ceilings, or Swan-Necks on Columns.**

a pair of pins Q, fixed on the hanger in such a way that, upon again lowering the lamp, these levers cause the upper portion of the stirrup, with the cup, to describe a radial path which clears the prong.

Where the conditions require it, the ball half of the joint can be fitted with an automatic ball-valve, which closes by a spring as soon as the joint is broken, so that the lamp may be removed even if the high pressure is present up to the joint.

The bye-pass is relit in the same manner as in the case of the traversing gear; and a spherical valve is arranged inside the ball for the purpose explained in the description of the traversing gear.

## FUNCTIONS OF THE MUNICIPAL CHEMIST.

### His Connection with the Gas Industry.

At the Meeting of the Society of Arts on Wednesday last, Mr. J. H. Coste, F.I.C., of the Chemical Department of the London County Council, read a paper on "Municipal Chemistry," in the course of which he referred to the connection of the municipal chemist with the gas industry.

The author at the outset remarked that there are two classes of services rendered to local authorities by chemists—the first comprising the duties which are imposed by Act of Parliament, and which necessitate or imply the creation of statutory appointments, the officers having specific duties often in themselves of a routine character, but which only attain to their full utility when carried out by a chemist of some experience. The oldest group of Acts under which *ad hoc* appointments of this kind are made are those regulating the great gas industry. The Metropolis Gas Act, 1860, section 27, provided, as a condition of districting the thirteen companies then in the Metropolis (which now, by successive amalgamations, are reduced to three), and the consequent creation of monopolies, that the gas supplied by them should be tested to ascertain that a prescribed standard of quality was maintained, and that "every local authority taking any supply of gas according to this Act . . . shall appoint . . . a chemical examiner or gas engineer or other competent person to be an examiner for the purposes of this Act." The various Acts relating to the Metropolis and to the Provinces—more particularly in the latter case, the Gas-Works Clauses Act, 1871—have provided that testings shall or may be made.

It will be noted that, though great latitude is allowed in the qualifications of the persons to be appointed, a chemical examiner is mentioned first; and the only actual requirement is competency—and, in later Acts, the very obvious one of impartiality. The greater part of the work—the determination of illuminating power, and, in some places, the much more important calorific power—is physical rather than chemical; but it has long been associated with the chemist—partly, perhaps, because it is recognized that gas making is essentially a chemical industry, and that the physical properties of coal gas are determined principally by its chemical composition.

Though the work is in itself of a routine character, and the methods are rigidly prescribed, it is obvious that a knowlege of the principles underlying them is to be desired in all cases; and, when an examiner is also adviser on gas matters to his authority, an intelligent, and in some respects a sympathetic, knowledge of the modern conditions of gas making is necessary, in order that the advice tendered may both safeguard the public interest, and allow the legitimate and economical expansion of a great industry on which has been conferred the duty of utilizing to the best advantage a large proportion of our limited supply of fuel.

Mr. Coste passed on to deal with another group of Acts, the earliest of which (1871) relates to the sale and storage of petroleum. The officer mentioned in these Acts appears to be rather a sampler than a chemist or tester; but nevertheless it has been held to be safer to appoint a testing officer. A consideration of the dangerous properties of some petroleum products, and of the more or less allied bodies which the law includes under the general name of "petroleum," will point to the desirability that these Acts should be vigorously, but (in view of the great and rapidly-growing uses of petroleum) judiciously, administered.

In many matters normally connected with the executive work of local government, the services of a chemist, although perhaps not obviously needful, are required, if the highest efficiency consistent with economy is to be reached. For example, the various residential institutions, educational, curative, preventive, or protective, are frequently extra-mural, and in such cases are more or less self-contained with their own sewage works, gas or electricity works, and water supply. In any case, large quantities of foods, cleansing materials, textile goods, oils, paints, and other engineers' stores, and fuel, are purchased annually, probably at very low contract prices. Systematic chemical examination of these several materials is in many cases the best—sometimes the only—means of securing that the goods supplied are of the required quality and at the same time allowing freedom of contract. The careful framing of specifications for goods, not necessarily the best obtainable, but of useful quality, and such as can be economically produced in the ordinary course of industry, is a matter which calls for the best abilities of the chemist. It is advantageous for control to be exercised independently of the officers actually using the goods—although by no means antagonistic to them.

The author next directed attention to the fact that the growth of municipal enterprise, particularly with respect to the supply of water, light, power, and the provision of means of locomotion, has increased greatly during the last decade. The question of the relative advantages of municipal and private undertakings is not one on which views are unanimous; but he thought it would be agreed that when such services are undertaken by public bodies, the highest efficiency, including economy of administration, should be sought. Such efficiency is in many cases promoted by the aid of a chemical examination of the materials used in the necessary works, by advice as to the best materials for special purposes, and on the cause of failure of materials. In the case of supplies of water or gas, a systematic examination of the products supplied by, as well as to, the undertaking is required. Few who are not engaged in such work will realize the great variety of goods used, in many cases without any adequate guarantee of quality. Many problems, involving much more than mere routine examination, and not always easy of solution, frequently arise.

In addition to all the more or less constant and regular demands for chemical assistance to the modern municipality, public bodies at times, when engaged in litigation or in promoting or opposing legislation, seek advice and require evidence to be given on their behalf on questions of chemistry as applied to industry or other matters of general importance. How are advice and assistance of the various kinds indicated to be obtained? That public bodies should in every branch of their service secure the best man available, none will deny; but how to obtain such a man is a less easy matter to decide. This was the subject next taken up by Mr. Coste. He remarked that unless a public body could afford to pay a good man with a fairly good man under him, it would probably do wisely to appoint a private practitioner as public analyst, and arrange with him to undertake the general analytical work, advise them, or put them in touch with more specialized knowledge than his own. It was clearly to the advantage of an authority with but little work requiring chemical aid to make use of the abilities and knowledge of a private practitioner, who could in this way give them the benefit of the result of a much more varied experience than they could otherwise command.

The paper closed with a few observations on the training of chemists.

# YORKSHIRE JUNIOR GAS ASSOCIATION.

### Last Ordinary Meeting.

In the enforced absence of the President, Mr. C. T. B. Roper, Vice-President, occupied the chair at the last ordinary meeting of the current session, when a large and deeply interested gathering assembled to welcome an old acquaintance in the shape of Mr. T. Brooke, the Superintendent of the Nechells works of the Birmingham Corporation, and one of the founders of the Association. From a variety of causes—a painfully restricted railway service being one—many of the senior members were unable to be present. This curtailed the discussion, though subsequent and informal discussion was copious, as the interest and value of the paper merited. Mr. Brooke frequently turned aside from his paper to amplify his points with examples and illustrations culled from his exceptionally full and varied experience; and additional assistance was given by the large scale drawings he had prepared and the specimens lying on the table before him.

The following is Mr. Brooke's paper:—

## SOME PHASES OF RETORT-HOUSE PRACTICE.

In a paper read before the Midland Junior Gas Association,* the author dealt at considerable length with the construction and working of retort-settings. In the present paper, he proposes to deal more fully with certain points he has hitherto only lightly touched upon.

### Pros and Cons of the One Ascension-Pipe Theory.

Until very recently, it was the usual practice to have two ascension-pipes for each horizontal through retort. The chief advantages claimed for this arrangement are:

(1) There is less decomposition of the unsaturated hydrocarbons, owing to the shorter distance which the gas has to travel in contact with the hot retort.

(2) When one ascension-pipe chokes, the gas can escape by the other one, and so avoid the waste that would occur if there were only one exit.

After considerable experience with both methods, the author has come to the conclusion that, though there is a certain amount of justification for each of these claims, the advantages of the two pipes are far outweighed by the disadvantages. Let it be understood, at the outset, that he would not recommend the use of one ascension-pipe when it is proposed to fill the retorts. In such cases—especially if the coal is to be rammed into the retort, or has a tendency to swell when carbonized—it would probably be found, with one ascension-pipe, that there would be excessive back-pressure in the portions of the retort farthest removed from the gas take-off. The partially-carbonized coal may offer quite as effective an obstruction to the passage of the gas as a stopped pipe would do.

With partially-filled retorts, fitted with one ascension-pipe, the advantages may be summarized as follows:—

(1) Considerable saving in initial cost of ascension-pipes, mouthpieces, mains, governors, tar-towers, &c.

(2) Considerable saving in labour, owing to—(*a*) The reduced number of pipes to auger, (*b*) greater freedom from stopped pipes.

(3) Greater yield of gas of equal illuminating power and increased calorific power per ton of coal.

The first claim and the first half of the second one are obvious, though many of those present may be inclined to doubt the validity of the second half—*i.e.*, greater freedom from stopped pipes. The statement can, however, be substantiated on both theoretical and practical grounds.

The author recently supervised the erection and working of sixteen through beds of horizontal retorts, with one 8-inch diameter ascension-pipe per retort. Great care was taken to see that all joints in these pipes were quite central, and that the interiors of the pipes were free from any irregularities. Though the retorts were worked at a very high temperature, the freedom from stopped pipes was truly remarkable. Except when we had a complete change of coal, the pipes gave practically no trouble at all; and, even then, they adjusted themselves to the new conditions in a very short space of time. The theoretical explanation of this is not very far to seek. When working with two pipes per retort, it is practically impossible to ensure that there shall be an equal resistance to the passage of the gas in either direction. Variations in seal, cleanliness of pipes, and direction of wind have all to be reckoned with; and the result is that, in most cases, at any given time one ascension-pipe is doing nearly all the work. As the conditions referred to change, the gas alters its course from one pipe to the other. This is repeated at frequent intervals, and results in the interiors of the pipes getting coated with a number of layers of pitchy matter which are often as hard as the pipe itself. If the pitching-up occurs out of reach of the auger, as it frequently does, the trouble will probably not be detected until pressure on the lids shows that both pipes are wholly or partially stopped. The obstructions are often so hard that it is necessary to take down the pipes and burn them out. That the gas does actually change about from one pipe to the other can be proved by taking temperatures in the corresponding bridge-pipes, or by feeling them with the hand.

* See "Journal," Vol. CXIII., p. 442.

It is commonly recognized that there are two ways to prevent stopped pipes—

(1) By keeping them so hot that no tarry matter condenses in them.

(2) By keeping them so cold that light tar condenses and makes them soft, in which case the temperature should at no time be sufficient to distil the tar and leave pitch in any portion of the pipes.

When the pipes are alternating between high and low temperatures, or are hot in some parts and cold in others, blockages are certain to occur. With one short ascension-pipe, the temperature is usually so high that there is little or no condensation; and consequently there are very few stopped pipes. Any stoppages that do occur are easily removed, because they have not sufficient time to get baked hard before their presence is manifested by the pressure on the lid. The fact that the gas is usually passing up one pipe only, at any given time, takes much of the force out of the first argument in favour of two pipes; while the freedom from stoppages actually found in practice discounts the second claim entirely.

Seeing that, with one ascension-pipe, the gas is always compelled to pass in the same direction, we find there certainly is a little more decomposition of hydrocarbons than when two pipes are used. But, on the other hand, light oils, which would otherwise be found in the tar, are converted into gas. The net result is an increased make of gas of equal illuminating power and greatly increased calorific power, with a slight reduction in the yield of tar. Any cracks in the retorts quickly scurf-up, so that very little gas is lost through leaks. A little extra labour is required for scurfing; but, at present prices, the scurf pays for the whole of the labour entailed in its removal.

The retorts previously referred to have now been in action from 900 to 1000 days without repairs, beyond pointing-up cracks after scurfing; and they are still in good condition, and giving splendid results. As a matter of precaution, a long auger is passed up each ascension-pipe every 24 hours, to remove any slight accumulation that may be forming. The formation of an extra quantity of sulphur compounds other than sulphuretted hydrogen is one of the few disadvantages of working with one ascension-pipe. For some time past, the price of tar has been rapidly rising; and should this continue, a time may come when the loss in tar referred to will be a very serious matter. But at present, at any rate, there is no doubt in the author's mind as to which is the better system.

### Regulation of the "Pull" on the Retorts.

It is very galling to a manager who is striving to obtain the last foot of gas out of his coal, to find that he is bound to work with a little pressure in his retorts in order to avoid spoiling his illuminating power by drawing in air when the retort-lids are open. In a large retort-house, charging and discharging are in progress practically the whole day long; so that there is little or no opportunity to increase the "make," while the lids are closed, by speeding-up the exhausters. In such a case, where there is no system of retort-house governors, the most that a manager can do in this way is to run a little extra liquor into each section of hydraulic main when the lids are open, and to run a little out of the tar-towers and reduce the liquor supply when the lids are closed. The tar-tower attendant has, however, nothing to tell him how much he is altering the seal; and consequently he frequently goes a bit too far. This is shown by a rapid drop of the jet photometer and recording calorimeter, if used.

In the works to which the author previously referred, there are four draws per shift of eight hours, each of which is completed in 40 or 50 minutes; so that there is an interval of 70 or 80 minutes every two hours, when extra gas making can be resorted to. While the lids are open, there is a slight pressure—say, half-a-tenth—in the retorts; but, as soon as they are closed, the pull is increased 4-10ths or 5-10ths, till it is time to commence the next draw. The reason why the illuminating power is not seriously affected by the extra pull is probably that the retorts are rendered so tight by the scurf. There is certainly no doubt that better results are obtained than by working with a constant pull. An experiment made on the Birmingham coal-test plant showed no advantage in this method of working—probably due to the fact that the retorts were not sufficiently tight to withstand the extra pull.

When the sections of hydraulic mains are controlled by a system of retort-house governors of the counterbalanced type, the variation in pull can easily be obtained by the arrangement shown in fig. 1. The two cans A and B, which are connected by a small rubber tube, will each hold sufficient water to make the desired alteration. The can B is suspended by a cord over a pulley, and is raised or lowered to make the adjustment. In this way, the change is made gradually, without disturbing the governor, as is often done when the alteration is made by means of weights.

### Retort-House Governors.

Retort-house governors came very much into prominence about six years ago. In certain cases they have a clear function to perform, and, no doubt, effect very considerable saving. There are many gas managers to-day, however, who are sorry that they ever had anything to do with them; and it would be a great boon to the industry if these men would make a clean breast of it for the benefit of others. The author could quote two cases where these governors have been installed, only to be thrown out of action

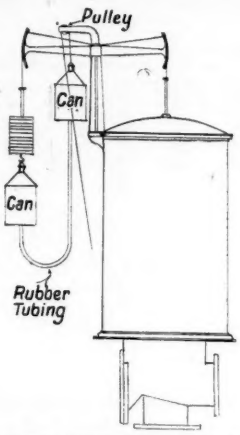



**Fig. 1.—Water Loading Arrangement for Varying the Pull at the Inlet of the Retort-House Governor.**

after a short trial, because neither the engineers nor the makers were able to get them to work properly. He is convinced that, in many instances, the real fault does not lie with the governors themselves, but rather with the arrangement of the plant or the method of controlling the exhausters.

It is worthy of note that, in each of these cases, there was a large proportion of the purifying apparatus (condensers, washers, scrubbers, &c.) in front of the exhausters, the pressure thrown by which varied considerably, according to the amount of gas passing. In at least one of the cases, the exhauster was governed by a vacuum-pipe connected to the main leading from the outlet of the retort-house governor to the condensers. All vacuums from 2 to 6 inches were tried in this main; but it was found impossible to keep this pull anything like constant and at the same time have the retort-house governor sufficiently free to govern effectively. By almost closing the cocks on the vacuum service of either the retort-house governor or the exhauster governor, a fairly constant pull could be maintained at the inlet to the former. Quite as good a line, if not better, could however be obtained without the retort-house governor; and the partially-closed cocks were constantly choking-up and causing trouble. When the retort-house governor and the exhauster governor were each given anything like freedom of action, the result was appalling. The former commenced to rise and fall at an alarming rate, and the exhauster got into the same swing. One minute it would be tearing away at a terrible pace, and in a few seconds it would scarcely turn the centres; and on one occasion it stopped altogether. The two governors would not work together, however the adjustment was varied. Experiments were made in altering the position of the vacuum services, but all to no purpose; and the retort-house governor was eventually thrown out of action.

Owing to the varying back-pressure thrown by the plant between the exhausters and the retort-house governor, and the constantly changing quantities of gas passing, the exhauster could not be run at a constant speed, or this might have solved the problem. The author is of the opinion that, if a compensating bye-pass governor had been provided for the exhausters, the trouble would have been overcome. In one works with which he was connected, such an arrangement worked very well. Here, however, there were no such rapid variations in the vacuum at the inlet to the exhausters as in the case referred to, so that there is really no comparison between them. The conditions were certainly rather exceptional; but surely there must have been many similar instances which it would be well to clear up. It is only fair to the makers of the retort-house governors to say that for years the engineers had been unable to get an exhauster governor that would negotiate the large variations of vacuum at the inlet of exhausters, and that one of the latest forms of exhauster governor failed dismally, in spite of all the efforts of the makers. Until the author designed an alteration to the bell of an existing governor, as explained below, the exhausters had, for some considerable time, been governed by hand. The bell was originally constructed as shown in fig. 2; the float B being entirely under water.

Owing to the great variations required in the speed of the exhausters, this governor was far too sensitive. However much the opening of the cock C was restricted, when the vacuum increased inside the bell, the latter would continue to fall until the exhauster nearly stopped. By this time, the pull in the foul main had dropped, and the bell commenced to rise and go to the other extreme. All alterations in the length of the connecting-rods, &c., were without avail. The author decided to put an additional annular float F (fig. 3) inside the bell; the dimensions of the float being such that, when the pull underneath the bell increased 1-10th, the latter would sink about 1½-10ths, and would remain in this position until the pull again changed.

The connecting-rods were so adjusted that the motion of the bell was rather more than sufficient to compensate for the change in vacuum. When this adjustment was made, the governor maintained a practically constant vacuum at the outlet of the retort-house governor for three days without attention. There was little deviation from the straight line on either side. This was a far better result than the author had dared to hope for. He had only

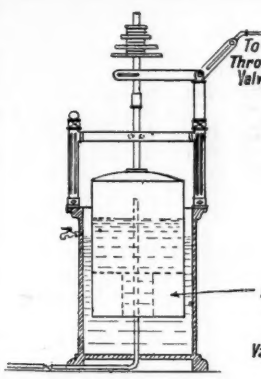



**Fig. 2.—Exhauster Governor as Originally Installed.**

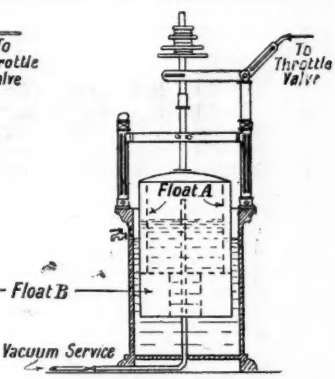



**Fig. 3.—Exhauster Governor with Additional Float.**

[The new governor, which had failed to act, was of a similar type, but with an enclosed bell.]

hoped to minimize the rapid changes in vacuum, and replace them by a steady rise or fall of the pull at the outlet of the retort-house governor, when the volume of gas passing made a considerable change. This rise and fall, however, proved to be so small as to be negligible. When working without the retort-house governor, two, or at most three, adjustments during the draw were all that were required; and, even if these adjustments were not made, the pull would keep within 1-10th or less of the desired limit. This governor has now been working satisfactorily for more than three years; and it maintains a more constant vacuum in the foul main than could be obtained by any of the governors previously tried, including the retort-house governor, which has long since been thrown out of action.

There is no doubt that retort-house governors are extremely useful where several retort-houses, or sections of the same house, which are controlled by the same set of exhausters, have to be worked with very varying dips, in order to maintain the same effective seal of the dip-pipes. When, however, the pull can be kept within about 1-10th inch in the foul mains, and there is no such variation in the dips, it would be folly to instal retort-house governors, except when it is desired to vary the pull on the several sections between the draws. If it is decided to put in such an installation, the counterbalanced type should be adopted—a fact which the best makers have now realized. Governors of the floating type are a continual source of worry.

There is one advantage of retort-house governors which should not be lost sight of—namely, that should the exhauster governor fail, there is no danger of getting an excessive pull on the foul main. On one occasion the author found the exhausters racing away, owing to the fact that the vacuum service to the exhauster governor had got choked. This caused a vacuum of about 24 inches at the outlet of the retort-house governor; whereas the chart on the inlet did not show the least variation.

## Patching Retorts.

Those of you who have inspected the interiors of retort-settings, after a considerable period of working at modern high temperatures, cannot fail to have been struck by the havoc caused by a too liberal use of hot patching cement. Silica and fire-brick are alike attacked by this material. It is no uncommon sight to see large silica blocks in the combustion chamber which are perfectly sound where they have been exposed to the heat, but which are absolutely honeycombed and perished where patching material has dropped on them from a hole or crack in the retort above. The author has often seen the combustion-chamber side of the lower retorts practically cut through from top to bottom in this way. Several instances have come under his notice where holes have been completely bored through the large silica blocks supporting the centre retorts in beds of eight; the blocks being otherwise as sound as when they were first erected. For some time, he made a practice of searching for the cause of any defect in, and around, the combustion chambers; and in almost every case the trouble could be traced to patching material. He has long since come to the conclusion that, if a hot patching cement could be discovered that would stick in a leak and stop there until the settings were let down for repairs, the life of the latter would in many instances be doubled. He has, however, also come to the conclusion that it is next to impossible to get a cement that will do this—for the following reasons.

In order to get a cement to stop in the leak, it must either flux, to enable it to adhere to the retort, or swell, so that it may get a firm grip on the rough edges of the retort—especially if the hole is in the crown of the latter. A cement which does not flux can rarely be made to stop in the leak for many minutes. It usually has a large content of silica; and it will disintegrate even more readily than a silica brick does, when exposed to rapid changes of temperature. Most hot patching cements contain a certain percentage of silicate of soda, to enable them to adhere to the retort; and it is these cements that do the damage in the setting. It is clear that if the retort is sufficiently hot to flux the cement at all, the latter will certainly flux more still when it is heated up to the temperature of the combustion chamber around the retort,

When it reaches this temperature, it drops into the setting, leaving the hole a little larger than before. This goes on until the surrounding brickwork gets fluxed away, air-ports and producer nostrils are choked up with patching material and coke, and eventually the bed has to be let down for repairs. In addition to the damage done to the setting, the waste of gas from such retorts must be enormous. There is another strong objection to these fluxing cements—namely, that if they suit one temperature they will probably not suit another. One that will flux slightly in a retort at 2000° Fahr. will probably not flux at all in one at 1700° Fahr. To overcome this difficulty, some makers supply different grades for different temperatures. This introduces complications in the working. Even if the patcher can judge the temperature of the retort sufficiently nearly with the naked eye, he soon discovers which cement sticks the best; and he will use this at every opportunity—to the detriment of the setting.

The author is extremely sorry that he is not able to recommend a really good cement. His advice is to insist on the use of brick cut to the size of the hole, and merely coated with hot patching cement. For very small holes, stiff fire-clay may be used instead of brick. Each leak, however small, should receive most careful attention, because it is from these that larger ones develop. A list of the patching in each retort should be carefully kept; and when this becomes excessive, the retort should be put out of action and thoroughly repaired. If this does not suffice, the bed should be shut-down as soon as it can be spared and thoroughly overhauled when cold. If the bed cannot be spared, and the retort becomes too bad to patch, it should be filled up solid with old bricks, and bricked-up at the ends. It is only necessary to brick-up the ends in the case of top retorts; but with the lower ones there are two dangers in omitting the brick filling—

(1) The damaged retort will probably collapse, and be followed by the ones above.

(2) When the retort has collapsed, the hot gases from the combustion chamber will in all probability short-circuit through the retort to the flue at the entrance to the regenerator. This will ruin the regenerator and spoil the heating of the bed.

The author has not yet been able to get the bad effects of hot patching cement on silica brick reproduced in the laboratory to any great extent, though the honeycombing of fire-brick can be demonstrated, as specimens exhibited plainly show. The effect was still more pronounced when cements were mixed with a proportion of flue dust. It is a rather remarkable fact that in the majority of cases no ill effects were visible until the specimens were broken. In one instance, a mixture of patching cement and flue dust spread over the broken face of a fire-brick was exposed to a temperature of 1550° C. for three hours. On cooling, there were no signs of fusion or honeycombing, until the brick was broken. It was then seen that the mixture had penetrated and honeycombed the brick to a depth of about 4 inches. Fire-clay mixed with flue dust had exactly the same effect. It is practically impossible to reproduce actual working conditions in a laboratory; otherwise he is convinced the same kind of action would take place. Time, exposure, flue dust, composition of the gases in the furnace, and nature of the coal, are all items which have to be considered.

For this reason, it is very difficult to estimate the value of patching cements in the laboratory. One which recently stood all the laboratory tests very well could on no account be made to stick in the retorts. The representative of the firm supplying the material then recommended the admixture of a certain percentage of silicate of soda, to give it more adhesive power, which, of course, would have brought on the old trouble again.

## Tar-Towers.

There is one point in the working of practically all modern retort-houses which requires much more scientific treatment and investigation than has hitherto been afforded to it—the working of the tar-towers. The chief functions of this apparatus are—

(1) To drain the tar from the hydraulic mains as quickly as it forms, in order to ensure a liquor-seal at all times.

(2) To maintain a constant immersion of the dip-pipes.

The danger arises here that presents itself with most automatic arrangements—namely, that they are left too much to look after themselves. It is too often taken for granted that, when once the weir-valve on the tar-tower has been adjusted to give the desired immersion of the dip-pipes, the seal will remain constant provided that (1) the pull does not vary, (2) the tar is drawn off at frequent intervals, and (3) a steady and uniform supply of liquor or water to the hydraulics is maintained, giving a steady overflow at the tar-tower. As a matter of fact, there are a host of conditions that may upset the calculations of those who place too much faith in tar-towers. To realize this fully, one only needs to glance at the usual arrangement of tar-tower shown diagrammatically in fig. 4. In order that such an arrangement may remain effective, the following conditions must prevail.

(1) The pressure of the gas in the hydraulic main must be equal to that in the top of the tar-tower. The equilibrium-pipe ensures this, *provided that it is kept perfectly clear*. No doubt many of you have experienced the trouble arising from neglect of this precaution.

(2) The weight, per unit of area, of the column of liquid A in the tar-tower must be equal to that of the column B in the tar main and hydraulic main. When we consider that the specific gravity of the tar deposited in the hydraulic main is usually

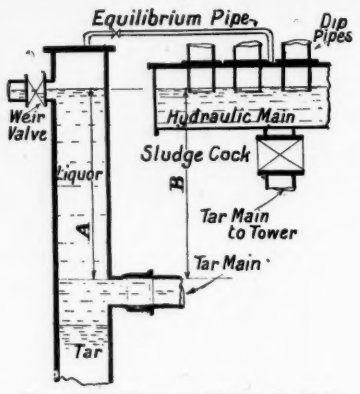



**Fig. 4.—Tar Tower and Hydraulic Main.**

1·20 to 1·25 (water = 1), it requires very little thought to realize that the presence of such tar in either of the columns A or B, in unequal proportions, would materially alter the immersion of the dip-pipes. The viscosity of the tar is also a disturbing factor. No trouble need be experienced from this source, however, if the tar-main is kept clear and the tar is never allowed to rise in the tower above the level of the bottom of the tar-main.

There are other factors which may cause a difference in the specific gravity of the liquid in the columns A and B. One of the most important of these, and one which is nevertheless very rarely taken into account, is the question of temperature. Tar-towers are often put in draughty passages at the end of, or between, the benches. In such a position, the temperature of the liquid in the tower must vary considerably according to the direction of the wind. The temperature of the liquid in the hydraulic main also varies considerably. Let us suppose, for the sake of argument, that when the weir-valve was adjusted in the first case, the temperatures of the liquid in the columns A and B were 20° and 70° C. respectively, and that, after some days, these temperatures had changed to 30° and 60° C.

| Specific Gravity of Water at | | | |
|---|---|---|---|
| 20° C. | ·99826 | 70° C. | ·97781 |
| 30 | ·99567 | 80 | ·97183 |
| 40 | ·99224 | 90 | ·96534 |
| 50 | ·98807 | 100 | ·95838 |
| 60 | ·98324 | | |

Taking the height of column A to be 54 inches, the height of column B in the first case would be—

$$\frac{54 \times \cdot99826}{\cdot97781} = 55\cdot13 \text{ inches.}$$

and in the second case—

$$\frac{54 \times \cdot99567}{\cdot98324} = 54\cdot68 \text{ inches.}$$

In other words, the dip would be altered 4½-10ths simply by the changes in temperature referred to.

On examining the table, it will be noticed that the specific gravity changes more quickly as the temperature rises, so that if the liquor in the mains, &c., were hotter than we have assumed, the variation in seal due to temperature would be greater still. For example, if the weir-valve had been set with temperatures A = 40° C., B = 60° C., and these had changed to A = 50° C., B = 50° C., the variation in the seal would have been 0·5 inch, against the previous result of 0·45 inch for the same amount of variation. The variation in seal is directly in proportion to the length A; so that the shorter this length, the more uniform will be the seals. As a rough figure, we may take it that, with A = 4 ft. 6 in., a change of 4° C. in the difference between the temperature of the liquor in the two columns will make a difference of 1-10th inch in the seal. [These calculations are based on the assumption that the coefficient of expansion of liquor varies at the same rate as that of water.]

It may also be noted that the specific gravity changes with the strength of the liquor; and so another very disturbing factor is introduced.

No doubt these considerations will come as a surprise to those of us who have hitherto fondly imagined that we knew the extent of the immersion of the dip-pipes to within 1-10th inch, and may serve to explain some apparently unaccountable variations in the quality of the gas. At any rate, they make us wonder whether the tar-tower really possesses all the advantages that are claimed for it. The author is of the opinion that, where the retort-house governors are able to maintain a level gauge in the foul main, it would be better to dispense with seals altogether, and to instal some simple form of anti-dip, which need not be perfectly gas-tight.

Under such conditions, the author would have no hesitation in working without either anti-dips or seals, except when starting-up or letting-down the beds. Some five or six years ago, he was anxious to try the experiment, as he felt sure that, by so doing, much better results would be obtained—especially where the dip-pipes were of uneven length, or the hydraulic mains were out of level. It was, however, thought to be far too dangerous a procedure; so that, except for short periods (in one case 24 hours), he has had no opportunity of testing the merits or demerits of the

system. So far as he could see during these short tests, the results were as good as with the usual arrangement, which consisted in sealing the dip-pipes when the lids were open.

Some time afterwards [Aug. 8, Sept. 12, and Oct. 31, 1908] the system was advocated in the columns of the "Gas World" by "K. P.," and considerable discussion took place on the subject; the general opinion being that it was a bit too risky. Only one case was mentioned in which the experiment was tried; and, in that case, the report was very favourable. Whether the system is still in operation, or has been adopted elsewhere, the author is unable to say.

When we consider that it requires about 70 per cent. of air to make an explosive mixture with coal gas, it is difficult to imagine how such a mixture could be made in the hydraulic main when the governors were regulated to anything like level gauge, unless a very large proportion of the lids were open at the same time. It is possible that there might be occasionally a slight puff in the ascension-pipe; but this would not be nearly so bad as when a lid is opened without torching.

Before leaving the subject, he would like to point out that, with tar-towers arranged as above, it would be almost impossible to work satisfactorily with tar-seals, because the liquor condensing in the hydraulic main would push the tar to the overflow, and thus there would be a liquor-seal and not a tar-seal. Moreover, the variations in specific gravity would make it impossible to regulate the seals with any degree of accuracy.

When tar-towers are used, it is advisable to take frequent records of the pressure in the arch-pipes and to adjust the weir-valves accordingly. Seeing that this pressure varies considerably from the beginning to the end of a charge, the records should be taken at the same time each day, and on the same retorts.

### Tar-Mains.

The last question which the author proposes to bring before your notice is in connection with the tar-mains leading from the hydraulic mains to the tar-tower. These mains are practically always made of cast-iron, usually with open lead joints. A little trouble in the way of caulking may be necessitated at times by leakage when lead joints are used, especially if the main is close to the top of the beds or fire buckets are used to remove stoppages. If an attempt is made to avoid this slight inconvenience by making the joints rigid, as in the case of rust or flange joints, care should be taken to make provision for the unequal expansion between this main and the hydraulic main (and in some cases the foul main also) to which it is attached. Neglect to do this will probably result in the fracture of the tar-main, with unpleasant, if not disastrous, results. It is necessary to make this provision between each of the branches connecting the same length of hydraulic or foul main. Steel tar-mains would be less liable to fracture; but, on account of the number of special pipes required, these would be very costly. To minimize the danger, the sludge-cocks should be placed close to the hydraulic main, and should be workable either from the top of the beds or from a position in front of the ascension-pipes. A valve should also be fixed at the inlet to the tar-tower.

### Discussion.

Mr. Sutcliffe inquired as to Mr. Brooke's opinion of the practice of doubly governing the exhauster, regulating the steam supply, and also a compensating valve on a bye-pass. Were both necessary? Did not one clash with the other?

Mr. W. Cranfield expressed his pleasure at having a long-cherished desire gratified by the appearance of Mr. Brooke as a contributor to the Association's proceedings. He was grateful to him for acceding to his request for a paper. His mind had many times that afternoon been reverting to a certain critical morning a good many years ago when Mr. Brooke and he discussed the question as to the advisability of their lecturer of that afternoon entering the gas profession. Seeing how successful Mr. Brooke's career had been, and what promise it held for the future, he was proud to think he had been in any way contributory to its start. The paper had been a happy blending of a wide range of practical experiences and the application of scientific principles to every-day problems. It was refreshing and helpful to have a stream of healthy scepticism and criticism playing around their stock notions and long-established practice. Too often custom hardened into the unquestioning persistence in certain methods, when a periodical review and investigation might reveal unsuspected errors and weaknesses in working, and equally unsuspected possibilities of improvement. He was glad to hear Mr. Brooke's insistence on close examination of such out-of-sight conditions as the real seal existing on dip-pipes, and on the careful checking of automatic appliances. One could not be too vigilant in checking working conditions and in gas-works tests. Some tests could only be verified by being repeated, but others could be confirmed by a sort of "cross-checking;" and often the doing of this revealed unsuspected errors of long standing. One of the great values of the afternoon's address had been that their attention had been directed to possibilities of error, and therefore also of improved working in matters where methods had been almost entirely systematized and crystallized. He was very pleased to hear Mr. Brooke's plea for frankness in telling of experiences—awkward and unsatisfactory in their outcome perhaps, but of great value to the industry at large. One hardly felt impelled to tell of "mistakes I have made"—one was much more ready and fluent in discussing "mistakes some one else has made;" and yet progress was largely dependent on a frank discussion of inconveniences and failures. There were many signs of a fuller recognition of this obligation, and of a growing frankness in helping the industry by the records of experiments and of knowledge gained. Retort-house governors were particularly a subject where much undivulged experiences existed, and upon which therefore opinions greatly differed. He had been interested in hearing of the extra pull given when the retorts were closed, and of the assurance that the retorts were very sound. What he had heard, and the sight of the gauge charts before them, had set him wondering what the nitrogen content of the gas was going to be. This nitrogen question was one of growing importance, and needed constantly bringing forward. When they contrasted Dr. Davidson's recent tests and his proof that 1 per cent. of the gas volume fairly represented the nitrogen directly yielded by the coal, and yet found 10, 11, 12, and even 13 per cent. of it in gas sent out in some towns, they saw a big question opening up before them that had far-reaching issues. Even if the settings in question were as sound as had been stated, all were not in this happy position, as even Mr. Brooke's startling revelations of the action of fluxed patching cement showed. It made one contrast the relative advantages of being content to lose a little gas by not over-pulling, and of retaining this gas and drawing in furnace gases. The patching difficulties raised again the matter of moulded *versus* built-up retorts, or at least of repairing by inserting shaped bricks and tiles, and thus making eventually a partly-built and partly-moulded retort. The existence of this honeycombing action of fluxed cement undoubtedly existed in larger measure than was generally suspected; and he had been greatly impressed with the specimens he had seen at various times, notably those Mr. Brooke had brought to his notice. He had been pleased to hear Mr. Brooke's emphatic opinion in favour of anti-dips or dry main. Early experiences had not been very encouraging with these appliances, but he was sure these early types were not the last word in this matter, and that the dispensing with seals was a promising direction of development in securing even and satisfactory conditions of working.

Mr. E. Garsed spoke of how the paper had opened up many questions to them upon which their minds would concentrate. He had been much impressed with the criticism of tar-towers and how their action would be greatly effected by changes in the relative temperatures of the hydraulic and the tower liquor. Would not coating the tower with a non-conducting material be one way of lessening the trouble? Or could an intercepting reservoir be inserted? Much of what Mr. Brooke had said in the matter of seals was of great helpfulness and vital concern to some of them.

Mr. Edwards eulogized the paper as giving valuable information on points concerning which too little was commonly said. As regards the single ascension-pipe for a through retort, he thought Mr. Brooke was on right lines. There might be—and doubtless were—drawbacks to the arrangement, of which the greatly increased yield of carbon bi-sulphide was perhaps the largest. The fact seemed clearly established by many people's experiences; and if a return to some measure of sulphur removal was made, the increased cost might have a potent influence on settling the question of one or two ascension pipes. Some time ago at Leeds, they had reached a similar conclusion as to the probable advantage of a single pipe, though they had tackled the question rather from the point of view of the naphthalene contents of the gas. The investigation had been suggested by the consideration of carbonization in vertical retorts. Here they had a solid mass of charge and a high carbonizing temperature and yet less naphthalene, and they had desired to see if they could not secure somewhat similar results if they approximated to a similar gas-travel. Some of Mr. Brooke's points were quite explained by considering the travel of the gas. He did not mention the oft-urged disadvantage of the single ascension-pipe—viz., the excessive length of gas-travel from the gas end of the retort, and the consequent possibility of the cracking-up of the valuable hydrocarbons, and reduction of the illuminating power, &c. Even in this case if one looked further into it, this greater travel might mean less time-contact, inasmuch as the distant gas had to travel with the nearer gas, and the speed of the whole had to be increased. He had not been able to push his experiments to their far conclusion. He had tried to get the tar produced from his one-pipe retorts, and had found it contained less naphthalene; but he could not isolate the gas, and had been forced to drop the experiments. He believed Birmingham had found an increase of naphthalene under these conditions. He could not quite understand why it should be; he should expect less to be produced. The production of more carbon with single-piped retorts he thought was to be explained thus. With two ascension-pipes, the pull acted on each and the gas could only travel at one rate, whereas with the single pipe the travel was rapid. With two pipes they were more likely, if not carefully adjusted, to draw in more air, so that if carbon were deposited it would get burned off. With a single pipe, there would be fewer times of vacuum. Less nitrogen was found in the gas; but that implied less oxygen drawn in, and consequently more carbon remained on the retort. The part of the paper dealing with tar-towers was very valuable, and he must agree with its final conclusion that seals should be dispensed with. Nitrogen in gas was mainly a question of seals. He noticed Mr. Brooke had not said a single word about oscillation in the liquor of the hydraulic main. This often amounted to inches. Let them imagine what it meant. Even with only 1 inch oscillation, and ½ inch seal, it meant a variation from 1½ inch seal to ½ inch pull, and this latter would be drawing in nitrogen. This nitrogen they were bound to draw in unless they adjusted their conditions to a

level gauge in the retort. The trouble will be worse with direct than with gaseous-fired settings, because of the greater excess of air in the gases of the setting in the former case. As he had previously said, scurf was often a matter of the exhauster—whether it was left on or burnt off. These variations of pressure conditions were inevitable with a hydraulic-main. Therefore he was driven to the conclusion that some form of anti-dip or no dip at all was the right course to adopt if little nitrogen in the gas was to be ensured. He had made experiments to test the connection between this oscillation and the nitrogen.

With 1⅛ inch seals and 1⅛ inch pull, he got 17 per cent. nitrogen.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ,, | 1 | ,, | ,, | 13 | ,, | ,, |
| ¾ | ,, | ¾ | ,, | ,, | 10 | ,, | ,, |
| ½ | ,, | ½ | ,, | ,, | 8-9 | ,, | ,, |
| ¼ | ,, | ¼ | ,, | ,, | 5 | ,, | ,, |

But he could not get down near the ideal 1 per cent. till he got rid of the seal altogether. He had tried working without seals and anti-dips, using a retort-house governor that only showed half of 1-10th inch variation. Even then he found it impossible to keep the pipe clear of sudden rushes of gas down the ascension-pipe that cleared the working stage of its operators. Still he believed, and his experiments confirmed his belief, that air was sucked in, and the hydraulic main gas ranged from a maximum of 0·7 per cent. oxygen to *nil* (when the gas rushed out). The experiments had to be discontinued, and he had been unable to resume them; otherwise he believed he could have got to a working that showed only 2 per cent. nitrogen. Even with an even pull and seal, oxygen always showed in the gas, showing that air was being drawn in, because by oscillation the dips were unsealed. It was important to open as few lids as possible at a time, as this was when air got in. He kept six beds under observation. While all lids were closed, the oxygen ranged from *nil* to 0·12 per cent.; when only 6 lids were open, it promptly rose to 0·3 per cent.

Mr. Brooke, in replying to the discussion, agreed with Mr. Sutcliffe as to the inadvisability of double-governing of the exhauster, and was surprised at the persistence of the habit. On the whole, he advocated a compensating bye-pass to ensure a constant pressure and not governing the steam—certainly if a retort-house governor was installed, and in cases where the washers and scrubbers were on the exhaust side of the exhauster. He assured Mr. Cranfield that the nitrogen contents of the gas made from the one-pipe settings was satisfactorily low, and the soundness of the retorts was further increased by the carbon made in them. As Mr. Edwards had mentioned, they did find a little more naphthalene in the gas. He agreed with him that there would be less time-contact with the gas in the half of the retort near the single ascension-pipe; but while some gas had twice the rate of flow it would have in a two-piped retort, other gas had double contact with the hot retort walls. He thought less carbon was formed with the two-pipes.

Mr. Edwards then pointed out that if all was summed up he thought it would be found that more hydrocarbon cracking existed with two pipes, but that more of the scurf got burned away with the greater indrawing of air due to oscillation in two hydraulic mains. He still thought less time-contact would be shown with one pipe, and that it was nearer the vertical retort ideal. Both aimed at the same end, minimizing contact of gas with hot walls, as it was only this contact and not radiant heat that cracked the hydrocarbons. If the bulk of the gas moved as a "core," there would be less cracking, but more of it travelled with a turbulent eddying movement; and he concluded that the "core" movement was the true description of what usually occurred.

Mr. Brooke admitted all that had been said about oscillation, but had omitted it deliberately, seeing that the paper was already full enough. In his experience, the longer the main, the more serious was the disturbance, while cutting the main into sections checked the development of waves travelling along the main. He had seen 3-inch and 4-inch oscillation in a long main.

Mr. Edwards had seen as much as 6 inches in a section where there were only six ascension pipes.

Mr. Brooke agreed with the contention that much air was drawn in when lids were open. On his works, although the inclined retorts were served by a gang of two men at the top and five at the bottom, they insisted that never more than four lids should be opened at any one time, and took vigorous measures to ensure that these instructions were closely observed. He had been glad to be with them, and had felt honoured by being invited to address them, while he felt he ought in his turn to thank them for coming on so fine an afternoon to listen to him. He had been a member of the Committee who engineered the formation of their Association, though when it was formed he had been debarred from membership because he was serving in a contractor's office. Still, now that he had been so long in actual gas-works management, he was quite at home among them, and glad if he had been of any service to them.

A cordial vote of thanks was passed; special mention being made of Mr. Brooke's kindness in coming from Birmingham on purpose for the meeting.

**The Southern District Association of Gas Engineers and Managers** will hold their spring meeting on Wednesday, May 15, when the members will visit the works of the Mitcham and Wimbledon Gas Company, of which the President (Mr. B. R. Green) is Engineer. Full particulars will be sent out in due course.

# SCOTTISH JUNIOR GAS ASSOCIATION.

## WESTERN DISTRICT.

### Annual General Meeting on Saturday.

This Meeting was held in the Glasgow Technical College—Mr. James M'Ghee, of Glasgow, in the chair.

The President, in opening the proceedings, said there had been momentous events since the last general meeting. They had come through a period of unrest, which he might say was without parallel in the industrial history of the country; but, fortunately, things were getting into better train. The unrest had had the effect of putting off the visit of the members to Alloa. But they looked forward to next month, when they would carry out the excursion along with the Eastern District Section of the Association; and they had Mr. Napier's word that he would do all in his power to make it an agreeable visit. There was another little item, that was the honour which had come in the way of their Secretary, Mr. David Fulton. He (the President) was quite sure everyone would be glad—and, personally, he was very pleased—that their Secretary should have secured the position of Assistant-Manager at Helensburgh. Mr. Fulton was to be congratulated upon getting the appointment; while his new employers would find him a capable, hard-working, faithful servant.

#### Financial Position of the Association.

The Hon. Secretary (Mr. D. Fulton) then submitted the financial statement. It showed that the year started with a balance of £20 7s. 6d.; and that the balance in the bank was now £11 12s. 1d., with 10s. 2d. cash in the Treasurer's hands. It was explained that several subscriptions had still to come in.

#### Office-Bearers for the Ensuing Year.

Mr. M'Ghee stated that, following the usual course, Mr. F. L. M'Laren, of Dumbarton, would occupy the presidential chair for the ensuing year.

In moving that Mr. John Wilson, of Falkirk, should be Vice-President, Mr. Fulton said he would occupy the position with honour to himself and credit to the Association.

The nomination was carried unanimously.

Mr. Fulton was reappointed Hon. Secretary and Treasurer.

To fill six vacancies on the Council, the following were appointed: Messrs. T. Carmichael (Glasgow), J. Grant (Glasgow), D. Lambie (Coatbridge), T. Orr (Motherwell), A. Wright (Strathmiglo), and A. Wylie (Glasgow).

#### Address by Mr. Alexander Wilson.

Next came the feature of the meeting—an address by Mr. Alexander Wilson, M.Inst.C.E., Engineer and General Manager of the Glasgow Corporation Gas Department.

The Chairman, in introducing Mr. Wilson, said he was a good friend to the Association. In view of the worrying time which he, in company with the other managers in Scotland, had had through the coal strike and other business, it showed a warm interest in the Association that he had made an endeavour and found time to give them an address.

Mr. Wilson then delivered the following address:

Mr. President and Gentlemen,—When your Secretary asked me, at the beginning of the session, to give you a paper on some subject, I said that if he would name a date near the end of the session, I would try to meet his wishes. At that time I was very much engaged with extra work in addition to the usual duties in connection with our large department, and I hoped that long before the end of your session I should find some spare hours when I would be glad of something in the nature of a paper to fill up the time. I had better confess at once that, owing to one thing and another, those idle hours that required something to fill them up have never appeared. The regular work of the department has increased so much that it has not only fully occupied the usual working days, but has overflowed into the time when one naturally expects a little leisure from regular routine. This being the case, the duty which I undertook to you and your Secretary was delayed time after time, until it had to be faced amid the troubles of the most severe labour war that has ever occurred. I am sure we are all glad that matters have been adjusted between the miners and their employers; and we would fain hope we shall not have to witness such a struggle, with all its attendant dislocation of trade, idleness, and privation, for many years to come.

In the Junior Association, the members may be divided into two classes—those connected with the manufacturing department and those connected with the distribution department. The experiences and interests of the two classes vary somewhat; but all are interested in the Gas Department as a whole, and whatever affects the one class has also a bearing on the other. This being the case, perhaps it will be better if I try to divide my paper between the two classes.

### The Manufacturing Department.

Dealing first with this department—not because it is the most important, but because it comes first in the natural order of things—we might try to apply a few of the lessons we have learned from the labour struggle through which we have just passed.

#### The Coal Miners' Strike and its Lessons.

Coal is almost as essential to a gas department as food is to an

individual; and the withholding of it is as fatal in the one case as in the other. We have been so much accustomed to fairly regular supplies being sent to our works, that when we are faced with a national stoppage of the mining industry we require some little time to fully realize the consequences that must ensue if the stoppage is continued for a long period. In the sectional stoppages of former days, coal could always be obtained at a price; and the complete shutting-down of any large gas-works was a thing that never entered into any of our calculations. In the present instance, even in works with large stocks, some considerable anxiety was created; while in works situated near the coalfields, where the necessity of carrying large reserves of coal had never been considered necessary, the result has been almost disastrous. The question which presents itself to all those who are interested in the manufacture of gas is this: What measures will require to be taken in the future in order to ensure a full supply of gas being maintained under the most extended stoppage of supplies that may possibly occur?

Many works which are provided with carburetted water-gas plant have been enabled to tide over the critical period by using their water-gas apparatus to its utmost capacity; and seeing the advantage these works possess over those which supply only straight coal gas, engineers will, no doubt, consider whether this kind of apparatus should not, in future, invariably form part of the regular equipment of their works. The only other method at the present time appears to be to increase the capacity of the coal-stores, and, in future, at whatever cost, keep them trimmed-up to their fullest capacity. There appear to be advantages and disadvantages attached to both methods. The capital cost per million cubic feet of gas made is much lower for water-gas plant than for an ordinary retort installation of similar capacity. Water-gas plant can be got ready for work in much shorter time, and suffers less damage by being repeatedly lighted up, than the ordinary retort-bench. Then the gas is produced from oil and coke, which are outside the scope of miners' strikes, and therefore make the plant of much greater value in times of labour troubles. Also oil requires less storage room than coal for a similar production of gas. These advantages may well compensate for the slightly higher cost of production; and if there were no disadvantages connected with the use of water gas, the installation of a certain percentage of water-gas plant in every gas-works would be a foregone conclusion.

The composition of carburetted water gas, however, differs from ordinary coal gas of similar candle power, requiring a different proportion of air for its complete combustion. Where only flat-flame burners are in use, a varying percentage of water gas mixed with coal gas does not matter very much; but where bunsen flames are used, as in cookers, gas-fires, furnaces, and incandescent burners, especially those of the inverted types, as well as in gas-engines, a varying percentage of water gas is very detrimental to regular working and results. Of course, where skilled attention can be given to the various appliances, and the air supply adjusted to the gas being used at the time, no great loss is entailed; but to the ordinary consumer, if the altered composition of the gas supplied prevails to any great extent, trouble and loss may be expected.

Most consumers have been so accustomed to full supplies of gas of fairly constant quality and composition that it is difficult for them to understand that the air-adjusters of burners, &c., require to be regulated to suit the composition of the gas supplied. The result, therefore, of sending out gas of considerably varying composition would be to cause dissatisfaction to our customers, and this might result in much loss of business.

To avoid these troubles, and still ensure a certain supply of gas, there appears to be at present only one other alternative, and that is to provide ample coal storage. In defining the word "ample," we must give it a much fuller meaning than has been done in the past. When the lesson of the late national stoppage of the coal supply has been fully appreciated, and the possibility and probability of similar stoppages in that industry and the transport service considered, I fully expect that it will be thought necessary to provide and constantly maintain reserves of fuel equal to not less than three or perhaps four months of our heaviest demands. The provision of this extra stock of coal will necessarily entail much extra expense for handling, a considerable charge for interest on unproductive capital, and the loss by deterioration, as the same results in gas, &c., need not be expected from coal that has lain a considerable time in stock as compared with the results from coal recently delivered. Against these disadvantages and extra cost of ample reserves of coal can be placed the certainty of a full supply of gas that is sure to give satisfaction all the time to consumers. The problem put to us by the expectation of further labour troubles in the future deserves to be well considered and faced in a courageous manner by those who have the direction of all industrial concerns, as I have no doubt it will also be faced by the average householder for his domestic supplies.

### USE OF AIR IN LIME PURIFICATION.

Another point on the manufacturing side to which I might briefly draw the attention of members was referred to in a paper read before your Association. The question of the value of using a percentage of air along with the gas to assist lime purification was discussed; and as a similar method has been in use in one of our works for some time, information regarding the working may be of interest. The figures given are for three different sections of purifiers when using air and without it.

TABLE I.—*Analyses of Waste Lime from Purifiers where Air has been Used and Without It.*

| | Without Air. Sections 1 and 2. Per Cent. | With Air. Sections 1 and 2. Per Cent. | Section 3. Per Cent. |
|---|---|---|---|
| Calcium carbonate | 66·80 | 67·04 | 70·72 |
| ,, hydrate | 25·45 | 17·14 | 13·83 |
| ,, sulphate | 1·01 | 1·50 | 1·20 |
| ,, sulphide | 1·21 | .. | .. |
| ,, sulphocyanide | .. | 4·40 | 3·53 |
| ,, thiosulphate | .. | 5·05 | 3·15 |
| Sulphur in other forms | 1·40 | .. | 0·40 |
| Free sulphur | .. | 1·46 | 3·14 |
| Iron oxide and alumina | 0·80 | 1·00 | 0·90 |
| Silica | 3·34 | 2·00 | 2·20 |
| | 100·01 | 99·59 | 99·07 |

It was found that considerably more gas could be purified per box when air was being used, as shown in Table II.

TABLE II.

| No Revivification (Feb., 1911). | | Revivification $N_4O$ (Feb., 1912). | |
|---|---|---|---|
| Gas Purified per Box. | | Gas Purified per Box. | |
| Sections 1 and 2. | Section 3. | Sections 1 and 2. | Section 3. |
| Cubic Feet. 2,302,263 | Cubic Feet. 2,530,800 | Cubic Feet. 2,756,000 | Cubic Feet. 3,525,192 |
| Gain in efficiency due to $N_4O$ | | 20 per cent. | 39 per cent. |

The increased efficiency obtained in section 3 of purifiers with air is probably due to the larger boxes in use, and the consequent slower travel of the gas through the lime; but even in Nos. 1 and 2 the larger quantity of gas purified per box shows that the addition of a small percentage of air—1½ to 2 per cent.—enables the lime to do its work better, taking up more sulphuretted hydrogen and carbonic acid. The quantity of free hydrate in the waste lime is much reduced; and the presence of free sulphur appears to show that a somewhat similar action takes place in the lime as occurs when oxide of iron is used for purification.

### CARBONIZATION.

With regard to the important subject of carbonization, a good deal of discussion has taken place; but there is still much work to be done before the relative values of verticals or chambers *versus* horizontals can be settled. Although one system may appear to give outstanding results for one place or district, on close examination the coal used or the local conditions may easily account for all the difference.

The striving for larger yields of gas and products from the coal, lower costs of working, and lower maintenance charges, is sure to benefit all gas authorities. It is only to be expected that favour will be shown to one system or another according to the results obtained; and it is for the good of the industry that this is the case. Members will do well to keep themselves thoroughly up-to-date in the knowledge of all that is being done by the various methods of carbonizing coal, so that when they have to decide for themselves which method they should adopt, they may have all the necessary information at hand to enable them to come to a correct decision.

## The Distribution Department.

When we come to deal with the distributing side of a gas department, a very hopeful, and one might almost say a fascinating, prospect opens before us. In the old days, before gas men awoke to the immense possibilities of our business, district work was of a very humdrum kind. Fixing and exchanging of meters, laying of service-pipes, and attending to leakages, formed the major part of the day's duties—routine work most of it, with little scope for brains. A man might be a good tradesman, and turn out a satisfactory job, or those in charge might give satisfactory service; but lack of interest and the simplicity of the work had their usual dulling effect, so that the men in the outside department were counted of little value in forwarding the interests of a gas undertaking.

### LIGHTING AND HEATING APPLIANCES.

How different is the position to-day for both the staff and the men! There is still the old class of work to keep the unambitious or old style of gas-fitter in employment, though even these men are being infected with the new ideals, finding more interest in their work, and taking more pride in helping forward the business of the department. For every man employed under the old conditions, ten or more men are now required to tackle the work that comes pouring in to the outside or sales department. What a variety of problems are connected with this extra work thrown on our outside staffs. All the various forms of lighting appliances, from the 4500-candle power high-pressure street-lamp down to the neat and equally efficient bijou burner suitable for drawing-room or reading lamp; then the thousands upon thousands of cooking appliances which do their work in the homes of consumers so efficiently and yet so economically, giving silent but effective help to housewives, and at the same time performing a good work for the whole community in assisting in a practical way the work and projects of the smoke abatement enthusiasts.

There is also the gas-fire and radiator section, which is coming so fast into public favour, and which will, without doubt, as further improvements are made, oust from its domestic throne the long-cherished and almost worshipped open coal fire.

The various kinds of apparatus for heating water for household purposes is sure to occupy a very large proportion of our work in the future. Of course, they require to be installed with care, and with a thorough knowledge of the rules that command success in installations of this kind. Where efficient apparatus is put down with the water connections and circulating tanks properly arranged, consumers are always delighted with the convenient and economical service rendered.

### INDUSTRIAL USE OF GAS.

In large centres of industry, the use of town gas (even where there are installations of producer gas) for manufacturing purposes is extending rapidly; the main difficulty encountered with this class of business being that of getting the attention of busy engineers and manufacturers drawn to the many furnaces and heating appliances now offered for their use. When we get even a single furnace once tested and worked for a short time in an establishment, it is sure to pave the way to further orders.

For large installations, it appears to be more economical to use gas under increased pressure—higher temperatures being obtained, enabling more work to be done in shorter time. Even with the ordinary pressures, a large variety of furnaces, &c., are on the market which give splendid results. As this class of business requires a practically constant supply of gas all the year round, every effort should be made to secure it; and as gas for these constant users can be sent out from our works at the minimum of cost, special terms should be offered to secure all the business possible.

### THE GAS-ENGINE.

Gas-engines deserve a large amount of attention from our outside staffs; but it is a pity that our output for power purposes does not show the same expansion as in former days. Gas-engines have now a keen rival in the electric motor; and although the production of power by the gas-engine is still less costly than by its rival, the fashion at the present time appears to be in favour of the latest article. For smaller powers, where the consumption of current is low, the electric motor has, without doubt, an advantage in convenience over the gas-engine; but for larger powers, as competition grows more keen, the gas-engine will, on account of its low costs, if properly handled, retain and extend its connection. It is worth noting that many minor improvements are being introduced by the makers which will tend to make the engines now sent out more reliable and steady in running, and also reduce very much the old trouble of starting, and the attention required to keep them in good order.

### SCOPE FOR THE OUT-DOOR DEPARTMENT.

These are a few items of work to which the attention of the men and staff of the distribution department are now being constantly directed; and the list grows larger every day. That there is immense scope for the brains and usefulness of every member of the department will be generally acknowledged. Intelligence and good, earnest work are required to allow the gas industry to secure the full benefit of the tide of prosperity which is now flowing so strongly. If the manufacturing department has a responsibility in producing the requisite quantity of gas required at the minimum of cost, those in the outside department have no less responsibility in assisting to distribute the gas so that it can be used by the consumers to the very best advantage.

### LOOK TO THE FUTURE.

The value of gas as an illuminating agent, and especially as a heating agent, continues pre-eminent; and there are still many problems and improvements on present methods awaiting solution. So that there is sure to be a good field for all those who take the right kind of interest in their work. To all who aspire to higher positions—I am sure all the members of your Association come under that category—I would say: Keep on doing your present duties to the very best of your ability, but, at the same time, get all the knowledge and practical experience you can to fit yourselves for higher positions. With our technical journals, &c., coming out regularly with their stores of valuable information about the latest developments in all sections of our business, and the training and education to be obtained in the Royal Technical College and other Institutions, the task of those who desire to ascend the ladder is not so difficult now as it was to some of us in earlier days. My advice to those who are determined to rise is—do not wait for the new position to present itself and then expect to acquire the necessary experience to do it justice, but be ready for the position when it comes along. Aim at the moon, and you will almost be certain at least to reach the top of the tree.

### Discussion.

The Chairman, in opening the discussion, said that while certain obvious principles had been dealt with in the address, it was none the less necessary that they should be brought home to the members in the free and open manner that had been employed by Mr. Wilson. But there were also two or three points which he was quite sure would raise some interest. He took it upon himself to ask Mr. Henry O'Connor to make a few remarks.

Mr. O'Connor said he was delighted to find Mr. Wilson pressing forward what he himself had mentioned at many meetings in the past—the necessity of having, not only a constant photometric and a constant calorific value, but also a constancy of mixing, so that they did not have a large quantity of methane at one time and a large quantity of carbon monoxide to take its place at another. This was a most important point, as Mr. Wilson had insisted. Methane required four times the quantity of air that hydrogen and carbon monoxide needed. If they were using water gas as well as straight coal gas, they would require to open up the air-holes. If they had large quantities of hydrogen or carbon monoxide, they would require to reduce these holes. Where gas companies or corporations were using gas which was rich one day in methane, and another day putting on water gas which was rich in carbon monoxide, there was a constant irregularity, as the composition of the gas changed. Another point concerned the removing and the turning-over of the lime, and the putting of it back again. He had been very interested in reading some time ago a paper delivered before the Association which dealt with this. There was no question about it, if anyone would look at the lime after it had been in the purifier and had been turned out, and would take a spade and break up the lumps, he would find a large quantity of lime that had not been doing its work in the purifier. If these lumps were broken up, and the lime replaced in the purifier, there was no question but that the opportunity would be given to this lime to do the work which it failed to do on first being put into the purifier. He remembered an occasion some years ago when works were being discarded and new ones built, and they were very much pressed for purifier room. To get the gas through the lime during the winter months, the engineer in charge had to use puddled clay in the lutes. The following year, he obtained a fresh appointment, and another engineer took his place. The latter engineer had been discussing with him (Mr. O'Connor) some time previously the question of mixing lime; and he (Mr. O'Connor) had suggested that it was an excellent plan to throw the lime through a screen. When he happened to visit the works later, he asked the engineer how he had got on with the purifiers and the puddled clay. The engineer explained that he had had to use the screen to get the gas through the lime without any difficulty. This showed the advantage of having the lime in such a condition that the gas passed easily through it. He had noticed a little remark by Mr. Wilson, which he was quite sure he did not mean in the way it might be read. He had said the bijou burner was quite as efficient as the high-pressure street-lamp burner. One, however, would only give 20-candle power, and the other furnished 40 to 60 candles. He was sure the bijou burner was not so efficient, though it was a very excellent burner for decorative purposes. As to the gas-engine, he knew of a printer in Edinburgh who, when starting fresh works, fitted his plant with electric-motors. At the time he did it, he had had considerable experience; and he considered it would be an excellent plan to drive the small machines which he used by this means. He used them for some time; but he expected not to be so busy as he had been in the old works. Luckily for him, he was very busy, and luckily also for the Gas Commissioners. He did not anticipate having to use the electric-motors regularly, but discovered he had to do so; and, on this account, he found them much more expensive than the gas-engine, and had to throw them out. When he employed them occasionally, they were all right, but used continuously they were expensive. He therefore put in a gas-engine, and reduced his bill for power to a great extent. In conclusion, he commended the last paragraph of Mr. Wilson's paper, with its recommendation to the Association to take all the chances they could of attending the college and studying there.

Mr. A. H. Whitelaw (Glasgow) thought Mr. Wilson had proved conclusively that it paid to pass air through the purifiers, because he was getting more of the sulphur impurity removed, and was taking more duty out of his lime, and getting a smaller percentage of calcium hydrate put out as useless. After doing so, he (Mr. Wilson) claimed he was getting a saving of 20 per cent.; but he would like to ask Mr. Wilson if, by continuing the passing of air, he was going to save 20 per cent. in the cost of purification. Coming to the question of carburetted water gas, he was glad to see that Mr. Wilson had had forced upon him the value of such a plant. The coal strike had brought it home to everybody.

Mr. J. A. Smith (Tradeston) said that, speaking for the manufacturing department, the figures and results given in the paper were borne out. In the case where they used air, they found their purifiers ran for much longer than formerly. He thought they did about 20 per cent. less changing of purifiers. There was another point he noticed particularly—when they used air they had not in the purifier-house the objectionable smell when the purifier was changed. Regarding the time of the coal strike through which they had passed, they had to use about 25 per cent. of first-class cannel. They found the gas was so rich that some of the burners were discovered blackening at the mantles.

Mr. G. Braidwood (Coatbridge) contended that there was one matter entirely overlooked by the advocates of air. It was almost impossible to send out the gas without free oxygen. This was bound to have a serious effect on the fittings and meters.

The Chairman remarked that, from extended observations of 30,000 meters per annum for the past two years, the effect was not noticeable yet.

Mr. Wilson, replying to the discussion, said that such points were better brought out in debate than in a paper. What was wanted in the Junior Association was for young fellows to get up and "slate" somebody or something for the sake of doing it. Then they would get into the way of bringing out good points. They were all much indebted to Mr. O'Connor for his statements

regarding the advantages of regular composition of gas. If lime were properly handled, a great deal more value could be got out of it. He explained that he meant the bijou burner was quite as efficient in its own place as the high-pressure gas-burner. Mr. O'Connor had seemed a little nervous of saying 60-candle power for high pressure. They had been testing a great many high-pressure lamps in Glasgow; and they had got over 60 candles. He hoped they would be able to maintain it. If they could not, he would want to know the reason why. Referring to the cheapness of the gas-engine, he said that, for erratic or emergency workings, the cost of the electric-motor was not so noticeable; but when they had long hours of steady work, the gas-engine was able to hold its own. If the figures were gone into, it would always be kept in its place, and not be changed for an electric-motor. Mr. Whitelaw had asked what was the total saving. He could not say exactly; but it was very well worth having. Mr. Smith had said there was less smell in purifiers when the boxes were being changed. This certainly was an advantage in town works. On the subject of free oxygen being detrimental to fittings and meters, he might state that, where the percentage of air was kept low (say, 1½ or 2 per cent.), a considerable amount of the oxygen was used up in the purifiers, in doing the work of revivification; and, consequently, there was not much going forward. He did not think he had heard of any case where the damage done to meters and fittings had been as yet very noticeable. He had great faith in the future of gas; and it would pay all those who interested themselves in their work in the proper way to give it their utmost attention.

Mr. Wilson was accorded a hearty vote of thanks; and the meeting concluded with a few words from

Mr. FULTON, who thanked the members for electing him for the fourth time as Secretary. There were, he said, many things about the Association which could be improved. One great point was that the country membership was not what it ought to be.

## MANCHESTER DISTRICT JUNIOR ASSOCIATION.

### Annual Meeting.

The Thirteenth Annual Meeting of the Manchester and District Junior Gas Association was held on Saturday afternoon at the Exchange Hotel, Manchester. Mr. A. L. HOLTON, the retiring President, occupied the chair; and there was a large attendance.

#### ANNUAL REPORT.

Mr. J. ALSOP presented the annual report of the Council. It stated that on April 1, 1910, the Association had a membership of 150, and that 19 new members had been enrolled in the course of the year; being an increase of six upon the preceding twelve months. On the other hand, however, eight members had resigned, two had joined the Senior Association, five were reported to have left the district or gone abroad, and one had been transferred to the Midland Junior Association—making sixteen in all. This left a net increase of three, and brought the membership of the Association up to 153. In regard to the "Transactions," the Council, after circularizing the members, had unanimously decided to order for this year the volume of Joint Transactions only. During the year, visits had been paid by members to the Blackpool Corporation Gas-Works, the Linacre (Liverpool) Gas-Works, and the Stretford Gas-Works; and the Council took this opportunity of expressing to the Engineers at these works, and the Directors of the Companies and the Blackpool Gas Committee, their appreciation for the hospitality and kindness shown to members of the Association on the occasion of the visits. In conjunction with the Senate of the Victoria University of Manchester and the Manchester District Institution of Gas Engineers, a series of lectures were given at the University during the session; and the attendance indicated that they were much appreciated. The Association were much indebted to the Vice-Chancellor (Sir Alfred Hopkinson), Professor Dixon, F.R.S., M.A., and Professor Peteval for arranging the lectures; to the Senate of the University for their generous contribution to the funds of the Education Scheme; and to the Manchester District Institution of Gas Engineers for their moral and financial support; also to Mr. H. Kendrick, Mr. S. Meunier, and Mr. T. Duxbury (Oldham). Many gas undertakings had subscribed to the University evening lecture course; and the Association tendered to all their hearty appreciation.

Mr. J. TAYLOR (Mossley), in moving the adoption of the report, paid a high tribute of praise to the Council for the excellent programme they had arranged for members in the past session.

Mr. J. WAREHAM seconded the resolution, which was carried unanimously.

The balance-sheet showed that a sum of £43 5s. had been received in subscriptions.

#### ELECTION OF OFFICERS.

Messrs. H. Butterworth (Blackley) and J. H. Massey (Oldham) having been appointed Scrutineers, the meeting proceeded to the election of officers for the year, including five members on the Council. There were four nominations for the Vice-Presidency; and the result of the ballot showed that Mr. W. L. Heald (Preston) had been elected. It should be added that Mr. Heald had been nominated for the position by the Council.

Mr. HEALD, in acknowledging the compliment paid him, said that he was in entire agreement with the policy of the Council on educational matters.

Mr. J. Alsop was unanimously re-elected Hon. Secretary. In the course of his response, he indicated that he would like to be relieved of the secretaryship at the end of the ensuing year.

The result of the ballot was as follows:

*Hon. Secretary.*—Mr. J. Alsop.
*Hon. Treasurer.*—Mr. J. Robinson.
*Hon. Auditor.*—Mr. C. Berry.
*Members of the Council.*—Messrs. S. Carter, J. Bridge, W. H. Cummins, A. Hodgson, and F. Dean.

#### COMPLIMENT TO THE COUNCIL.

Mr. J. BRIDGE proposed a vote of thanks to the Council for their services during the past year. He said that the very high percentage of attendance at the Council meetings showed that members realized the importance of the position they occupied; and it was quite evident to the members that the programme for the past session had not been prepared without a great deal of time and labour having been given to it by the Council.

Mr. F. H. GOODWIN (Salford), who seconded the resolution, said he would like to see the Association have a few more meetings and more papers read by their own members. There was no doubt that they had learned a great deal from the University lectures; but he believed if they could have a number of papers each session from members of the Association it would be to the advantage of them all.

The resolution having been carried,

Mr. F. THORP responded on behalf of the Council. He said the time had come when he had to retire from the Council and make way for someone else. He hoped that the new members on the Council would work harmoniously with the others, as no doubt would be the case, so that the Association would continue to progress and achieve even greater results than they had done so far. On behalf of those who might propound new schemes for the advancement of the Association's work, he suggested that any such proposals should be given careful and considerate attention, and not be hastily condemned without a fair trial.

#### THE NEW PRESIDENT.

Mr. HOLTON said that the time had come for him also to retire. During his year of office it had been his aim to conduct the affairs of the Association in such a manner as would tend to advance its welfare and that of its members. It was true that nothing very new had been brought forward during his term of office; but he thought he could claim, with some degree of confidence, that they had accomplished much good and useful work. In asking Mr. Hollingworth to take the chair as his successor, he expressed the hope that this gentleman would have a most successful year of office.

Mr. HOLLINGWORTH, who was received with applause, observed that his first duty was an exceedingly pleasant one, and that was to have a vote of thanks passed to the retiring President for his services.

Mr. H. BUTTERWORTH, in moving the resolution, said the progress made by the Association was undoubtedly due to the fact that they had had hard-working men on the Council, and also progressive members in the presidential chair—Mr. Holton being one of the best they had had in this capacity.

Mr. J. BRIDGE, in seconding, remarked that Mr. Holton had given them of his best, and members had done their best to support him in his work.

The newly-elected President having added his meed of praise to Mr. Holton for the manner in which he had discharged the duties of his office as President, the resolution was put and carried with much applause.

Mr. HOLTON, in responding, referred with satisfaction to the fact that during the past year the Council meetings had been well attended—showing the great interest the members took in the affairs of the Association. The percentage of attendances had never been higher.

Mr. HOLLINGWORTH then expressed his thanks to the members for having elected him President. It would be his endeavour, he said, to maintain the high standard set by his predecessors in the office; and seeing that in recent years they included men like Mr. Taylor, Mr. Thorp, and Mr. Holton, he felt that he had got his work "cut out." As President, he would welcome any suggestion that was made to him from members for the improvement of the syllabus; and he would take care that any such suggestion should be properly discussed in Council, and the result notified to the members. He was sorry to disappoint the members in regard to a Presidential Address on some technical subject, as was expected on an occasion like this. He had prepared an address on the present methods for the valuation and sale of tar; but having quite recently changed his position in the gas profession, he had been advised that the reading of such a paper would not be desirable on his part. Under the circumstances, he asked the members of the Association to allow him to give his address at a later date.

#### THE PROGRESS OF THE ASSOCIATION.

The PRESIDENT next referred to the work the Association had accomplished, and what might be done in the future. Ever since its inception in 1898, the Association's history had been one long record of progress, both in membership and utility. Each succeeding Council had vied with its predecessor in producing some new scheme for improvement, with the result that the Association

to-day occupied a position which surpassed, no doubt, the dreams of its founders, to whom they owed so much. He asked his hearers just for a moment to compare the facilities enjoyed by past and present members. In the early days of the Association, visits to works were rare, and not popular with works managers. Evening classes for students in gas engineering and supply were few and far between, as were also opportunities for the discussion of works problems. Now, entirely due to the initiative of the Junior Gas Association, they had high-class lectures by the best exponents of gas practice; they had lecture courses at Universities, with syllabuses drawn up expressely to suit the members; they enjoyed the publication of the "Transactions" of all the Junior Gas Associations in one volume at an absurdly low price; and they had facilities for visiting works of all kinds for the inspection of new methods, plant, and machinery. Not the least of their advantages was that of direct connection with the Senior Association, which he believed had been of benefit to both organizations. Their facilities for education at evening schools were increasing every year; and, lastly, they had a Technical Press absolutely unsurpassed by any industry in the world. Considering all the advantages they at present enjoyed, it was difficult to see how they could possibly hope for anything more. Among the good things he trusted the future had in store for them, was a still closer connection with the University; and for himself he would not rest satisfied until those members of the Association with problems to solve would be able to work them out in the laboratories of the Universities. He also hoped the future would show that the cost of this would be defrayed by the companies and corporations employing members of the Association. They had the staff, laboratories, and class-rooms of one of the finest Universities in the land at their disposal, and they had men willing and capable of carrying out the work. They had certainly problems awaiting solution; but they had not the funds to enable the work to be done. He sincerely trusted this disability might soon be removed, and that a fund would be started out of which might be met the cost of enabling some of their younger gas employees to work at the Universities. He specially referred to those who had had some years' training on a gas-works, and who therefore appreciated some of the difficulties that faced them. He was pleased to hear the Council had decided to extend a welcome to the staff of coke-ovens, &c., because he was sure that nothing but good would result from the admission of the technical staff of such works, which were so closely allied to their own. He thought he might say that they would be still more closely connected in the future, as many coking plants now being erected were so arranged as to be able to supply illuminating gas when this was required. He had just returned from a visit to German gas-works and coke-ovens; and many of the latter were supplying towns with gas for lighting purposes. At the works where he was now engaged, they would shortly be in a position to supply something like 500 million cubic feet of lighting gas per annum. These works covered a site of 50 acres, and employed about 3000 hands. There was a large Mond plant of nine producers, with sulphate and tar apparatus. There was a battery of 84 coke-ovens on the Simon-Carvès system, with benzol abstractors, and tar and sulphate plants. Then there was a most modern installation of 92 coke-ovens on the Carl Still system, with benzol plant, and also sulphate plant and carbolic acid manufacturing. Then, of course, there were the requisite huge gas and steam engines and electric motors used for the colliery and works purposes. With the sanction of his Directors, he extended an invitation to the members of the Association to pay a visit in the autumn to the Birchenwood Colliery Company's works, when he would be in a position to give them his postponed Presidential Address.

BADLY-PAID GAS OFFICIALS.

Turning to deal with the subject of the remuneration given to junior members of the gas profession by their employers, Mr. Hollingworth made some pertinent remarks, and declared that he would do what he could to secure reform in this direction. As a direct result of the great facilities for education now enjoyed, he thought it might truly be said that the standard of ability of gas-works' staffs was immeasurably superior to what it was ten years ago. But could it be said, he asked, that the standard of remuneration had correspondingly risen? He said, "Decidedly not." While it was true that some undertakings paid their staffs a fair and reasonable salary, it was equally true that the vast majority paid sums which would be despised by an average bricklayer who had his usual "Monday off." There was not a man present who could not point to a round dozen of his friends who were receiving less than £3 a week, although married—men employed as draughtsmen, chemists, and accountants with gas undertakings. He trusted that "the powers that be" would soon recognize the value of such men as heads of works' departments to supersede illiterate "rule-of-thumb" foremen, by whom the industry suffered much. The country's gas-works were not by any means over-staffed with educated men; and he should say that the present staff at most works could be doubled with the greatest advantage to the balance-sheet. Therefore, he hoped that the near future would bring to self-denying students the promotion they deserved, having charge of retort-houses, purifying processes, condensing and scrubbing plant, &c.—in fact, in almost every position now occupied by unlearned workmen.

On the motion of Mr. C. E. Woodhead (Manchester), seconded by Mr. Holton, the President was thanked for his invitation to members of the Association to visit the Birchenwood Colliery Company's works in the autumn.

This concluded the business part of the proceedings.

THE SOCIAL SIDE.

Subsequently the members dined together in the same hotel, and afterwards a programme of toasts and songs was gone through. The newly-elected President was in the chair, supported by Mr. E. Astbury (Liverpool), Mr. James Taylor (Mossley), and the principal officers of the Association.

Mr. F. Thorp, who proposed the toast of "Kindred Associations," referred to the very friendly relationship existing between the two Manchester organizations. The Juniors had reason to be grateful to the Seniors for the help and encouragement given them in their work, especially in connection with the University Lecture scheme.

Mr. J. Taylor (Mossley), in the course of his reply, said the feeling that prevailed among the Seniors towards the Juniors seemed to him to be expressed in the words "What can we do for you?" It was not unlikely that there would be developments in the future resulting possibly in their becoming one body with junior sections.

The toast of "Our Guests" was submitted by Mr. S. Carter (Garston), and replied to by Mr. E. Astbury (Liverpool).

Mr. W. L. Heald (Preston) proposed the health of the "President;" and this was given with musical honours.

## New Appointment for Mr. J. H. Brown.

We learn that Mr. J. H. Brown, of Dewsbury, who a few months ago relinquished the position of Gas Engineer to the Corporation of Nottingham, has recently been appointed as Engineer and Manager of the Gas-Works Department of the Simon-Carvès Bye-Product Coke-Oven Construction and Working Company, Limited, of Manchester. The Company are well known as coke-oven builders; and it may be remembered that they have a patent process for the direct recovery of sulphate of ammonia from crude coal gas.

## Swiss Association of Gas and Water Engineers.

We have received a copy of the proceedings of the thirty-eighth annual meeting of the Swiss Association of Gas and Water Engineers, which was held at Fribourg on the 24th to the 25th of September last, under the presidency of Herr A. Weiss, of Zürich. The proceedings form a quarto brochure of fifty-seven pages, with six sheets of diagrams and drawings. The communications to the meeting are reprinted in full, together with reports of the discussions on them, as well as the President's address, and the report and accounts of the Association. The paper of most general interest to gas engineers outside Switzerland was that on the "Continuous Retorts at the Lausanne Gas-Works," by M. W. Cornaz, the Manager of the works. An abstract translation of this paper has already been given in the "Journal." [See Vol. CXVI., p. 172.] The other communications mainly related to Swiss gas and water supply. Among them was one by Dr. Schläpfer, of Zürich, on "Native Gas Tars," in the course of which he discussed the properties of tars produced from horizontal, inclined, and vertical retorts in relation to their applicability as fuel in Diesel engines. Some particulars of this paper will be given in an early issue of the "Journal." The report of the "Proceedings," was prepared by Herr C. Roth, of Zürich.

## Société Technique du Gaz en France.

The current issue of the "Journal des Usines à Gaz" contains the preliminary programme for the forthcoming congress of the Société Technique, which will open in the hall of the Society of Civil Engineers, Paris, on the 18th of June, under the presidency of M. Marquisan. The business on the morning of the first day will, as usual, consist of the admission of new members, the presentation of the reports of the Committee and the Treasurer, and the nomination of the members of the Committee for the ensuing year. In the afternoon, the distribution of the Government medals will take place, and reports will be submitted on the awards for the best communications to last year's proceedings at Marseilles, and the prizes given to the most deserving employees and workmen. The rest of the day, as well as the mornings of the 19th and 20th, will be devoted to the reading and discussion of papers. In the afternoon of the 19th, the members will visit the station of the Paris Gas Company at Le Landy; and in the evening there will be the usual banquet. In the afternoon of the third day, the members will go to the works of the Liquid Air Company, at Boulogne-sur-Seine, to hear a discourse by M. Georges Claude. During the meeting, the following subjects will be brought up for discussion: "Production of Gas from Lignite and other Materials;" "High-Pressure Gas, and the Distribution of Gas at a Distance." There will be the usual exhibition of gas appliances in the entrance hall at the place of meeting; and the Paris Gas Company will afford the members every facility for inspecting their stations for the distribution of gas at high pressure, and for making themselves acquainted with the various applications of this gas in Paris.

# CENTRAL PRODUCER GAS PLANT AT THE VIENNA CORPORATION GAS-WORKS.

It was decided when extensions of the carbonizing plant had to be carried out at the Simmering Works of the Municipality of Vienna in 1907 to heat the new retort-settings by means of producer gas from a central station instead of by separate producers. Up to that time, carbonization had been carried out solely in 180 beds of nine inclined retorts, each bed having its separate producer. The reasons which led to a change of system in this respect are given in a recent number of the "Journal für Gasbeleuchtung" by Herr Karl Marischka (one of the Works Engineers of the Vienna Corporation gas undertaking), who describes the new central installation of producers.

The advantages of the central producer gas plant are stated to be:

1.—That the producer gas can be freed from blown coke dust, and consequently the deposition of such dust in the flues of the setting is avoided. A greater life of the firebrick masonry is anticipated therefrom, as well as a saving of fuel.
2.—That a cheaper coke may be used.
3.—A reduction of wages, owing to the centralization of the plant, and the possibility of adopting producers with provision for automatic clinkering.
4.—The possibility of providing conveying plant for the fuel and clinker.
5.—The cleanliness and ready control of the working.
6.—The possibility of using fuel other than coke—such as brown coal (lignite).
7.—The formation of producer gas considerably more uniform in composition.
8.—The considerably higher duty obtainable from the fuel in the modern producer as compared with small separate producers.

The first central producer gas plant erected at the Simmering Gas-Works consists of five Duff producers, which serve for providing the gas for heating the new beds of Koppers inclined carbonizing chambers. One of the producers is shown in section in fig. 1 with its dust-extractor. The reduction of the velocity of

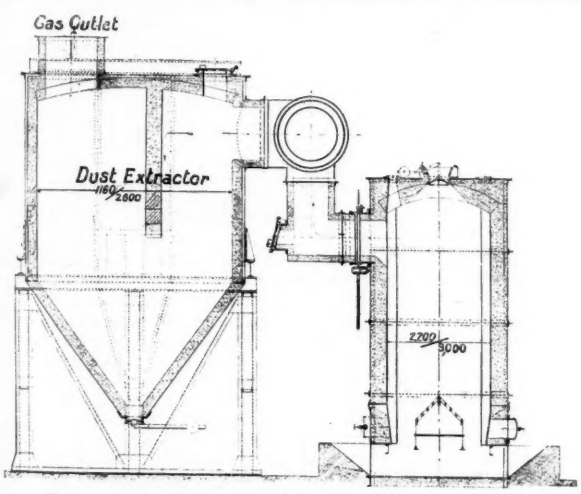



**Fig. 1.—Section through Duff Producer and Dust Extractor.**

the stream of gas which takes place in the dust-extractor causes the deposition of the greater part of the dust carried by the gas. The gas, thus cleansed to a certain extent, passes to the furnaces of the inclined chamber settings through a wrought-iron main jacketed with brickwork. The experience gained with this first central producer gas plant (which is still at work) confirmed the view that the method was generally correct, but disclosed the disadvantages of the Duff producers, and of incomplete dust extraction. In subsequent central producer gas plant the attempt was made to avoid these disadvantages, which were especially:

1.—The absence of automatic clinkering.
2.—Too great expenditure of fuel in making steam for the production of the gas and for breaking-up the clinker.
3.—The inadequate extraction of the dust.
4.—The obligation of taking the producer gas while hot to the settings.
5.—The necessity of using large coke or, at any rate, better and larger coke than breeze.

The question came to a head, the author states, when it was decided to instal Koppers horizontal carbonizing chambers for the extension of the plant at the Simmering Gas-Works, and when a prolonged trial had convinced the authorities of the gas-works that the Kerpely producers fully satisfied the requirements. The Koppers system depends on regenerative heating with simultaneous preheating of the air and gas, and not only facilitates the adoption of detached producer plant, but indeed demands it. The regenerative settings of horizontal chambers could not be transferred from the coke industry to gas-works without some modification; and, similarly, producers used in different industries could not be forthwith adopted by gas-works. Attention had especially to be directed to the provision for cooling the gas and extracting coke dust and traces of tar from it.

The standard pattern of Kerpely producer is shown in section in fig. 2. It is a rotating grate producer having a water-jacket A,

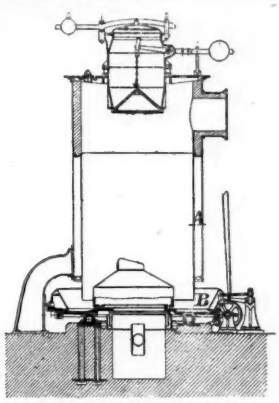



**Fig. 2.—Section through Ordinary Kerpeley Producer.**

which prevents the adhesion of clinker. The working is automatic and continuous. The pan-shaped base B is turned at such a rate (depending on the amount of ash in the fuel and the amount of gas required) as will suffice to keep the level of the charge practically constant. Owing to the loosening effect of the rotation of the grate, the blast is very uniformly distributed, and consequently the gas made is of uniform composition. From 0·2 to 0·5 H.P. is required for turning the grate. A Kerpely producer 6½ feet in diameter gasified 15 to 19 tons of coke, or 21 to 25 tons of brown coal in 24 hours.

This type of producer has been adopted in conjunction with the Koppers carbonizing chambers, both at the Simmering works and at the new works at Leopoldau. The apparatus for cooling and cleaning the producer gas was also provided by Messrs. Koppers at both works. The new central producer gas plant at the Simmering works comprises eight Kerpely producers, and the initial installation at the Leopoldau works comprises twelve producers. Following a suggestion of Herr H. Koppers, the jackets of the producers have been constructed to serve as boilers, so that the sensible heat is utilized to form steam at a working pressure of 6 atmospheres. The steam produced serves not only for driving the blast and cleansing fans of the producer plant and the boiler-feed pumps, but is partially available for other purposes. The heat efficiency of the producer with the boiler is extremely high—viz., about 95 per cent. The power required for working the producer and the dust-extraction plant is thus obtained free of cost. The nearly complete utilization of the fuel in the producers, and the extremely good combustion of the producer gases in the regenerative settings, are responsible for the low fuel consumption of the horizontal carbonizing chambers at Vienna. In adapting the producer to serve as a boiler, it is necessary to leave clear access to the interior of the vessel at the top, and to avoid difficulties in the removal of dust and the carrying out of repairs. The four producers originally tried at Simmering had boiler tubes in the top of the producer, whereby its height was increased and free access to the interior was interfered with. In the subsequent installations, a suggestion of the author's has been adopted; and the producers are constructed as shown in fig. 3. It will be seen that the boiler tubes are placed at the side and connect an upper with a lower annular boiler. The heating surface is as great as with the earlier type; and the interior of the producer is quite accessible from above.

Fig. 3 gives a section of the producer-house at the Leopoldau gas-works. The increased cost of the plant, due to the construction of the producers to serve as boilers, is of small significance compared with the extremely high duty obtained from the plant. Each of the producers deals on the average with 15 tons of coke in 24 hours, but a considerably higher maximum capacity is obtainable. The fuel used at the Leopoldau works is breeze not exceeding one inch in size. The producer gas has the composition:

| | Per Cent. |
|---|---|
| Carbonic oxide | 29·84 |
| Hydrogen | 9·12 |
| Carbonic acid | 2·78 |
| Methane | 0·80 |

Its net calorific power is 137 B.Th.U. per cubic foot. There is obtained at the same time about 1·13 lbs. of steam per lb. of fuel. This is equivalent to an evaporation of 2·3 lbs. of water per square foot of heating surface. About 1·43 per cent. of the coke is lost in the clinker. The total efficiency of the producer with boiler is about 98 per cent. The gas leaves the producers at a temperature of about 220° C. (428° Fahr.), and is washed and cooled in disintegrators. Allowing for the steam used in working, the actual efficiency of the fuel is about 95 per cent. The gas contains from

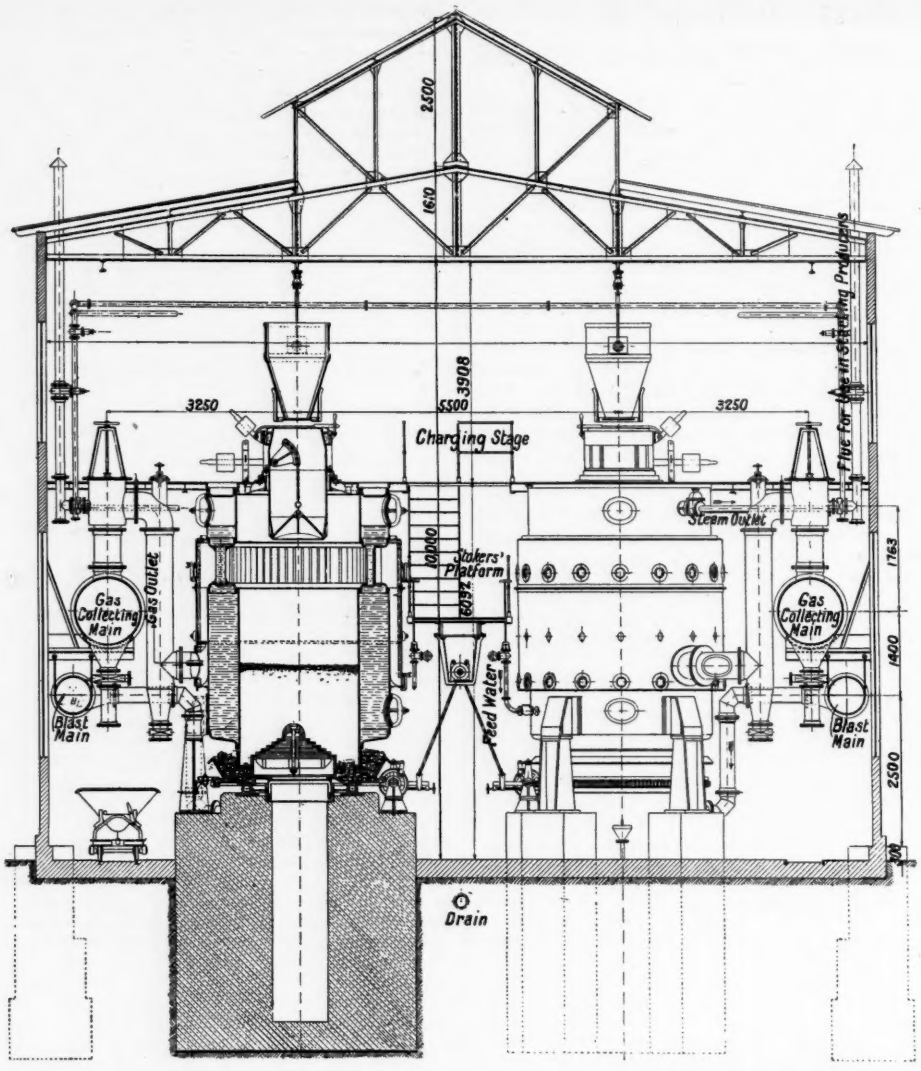



**Fig. 3.—SECTION THROUGH THE LEOPOLDAU PRODUCER-HOUSE (DIMENSIONS IN MILLIMETRES).**

about 2200 to 3500 grains of dust per 1000 cubic feet, which is reduced by the cleansing plant to about 9 grains per 1000 cubic feet. In the plant at the Simmering works, the extraction of the dust is effected by washing the gas in high towers standing in the open, in which it is sprinkled with water, and by means of fans into which water is squirted. In order to diminish the consumption of water for the purpose and to secure greater freedom from dust, another arrangement has been adopted at the Leopoldau works. Instead of the washing towers, the gas passes into disintegrators resembling those used for cleansing blast-furnace gas, which are placed under cover directly in front of the fans.

In settings with attached producers, the sensible heat of the producer gas is directly utilized in the setting, but with central producer plant this sensible heat becomes available instead in the form of high-pressure steam. The direct loss of the sensible heat to the settings is not uneconomical, because the absence of dust in the purified gas from the central plant admits of more efficient constructions of regenerative settings being employed in place of the recuperative settings with attached producers. The figures obtained for fuel consumption at the Vienna Corporation Gas-Works are not attained by any other modern system of settings with attached producers in use on gas-works. For the complete carbonization of Ostrau-Karwiner gas coal the consumption of pure coke, including that remaining unconsumed in the clinker, amounts to only 10 per cent. by weight of the coal carbonized. Moreover, it must not be forgotten that the dustless producer gas gives a considerably increased life to the masonry of the settings. In regard to the higher cost of the central producer gas plant as compared with separate producers, it should be borne in mind that, in addition to the advantages for heating the setting, there is obtained a surplus supply of steam available for other purposes. At the Leopoldau works, this surplus steam is utilized for concentrating the ammoniacal liquor. Obviously, the heating surface of the producer boiler can be made smaller or larger according to the amount of surplus steam required.

At Vienna, the breeze used ranges from dust to one inch in size, and a perfectly satisfactory heating gas is obtained. An attempt is now being made to use breeze ranging from dust to half an inch in size. A central producer gas plant is at the present time being installed at the new gas-works at Budapest, which will comprise producers on the Kerpely system intended to gasify either such breeze or brown coal, and working under a high pressure.

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**Eastern Counties Gas Managers' Association.**—As already briefly announced in the "JOURNAL," the forty-seventh general meeting of this Association will be held at Peterborough to-morrow, under the presidency of Mr. F. M. Paternoster, of Felixstowe. According to the programme issued by the Hon. Secretary and Treasurer (Mr. Joseph Davis, of Gravesend), the business, which will be transacted in the Grand Hotel, will include two papers—one by Mr. A. F. Young, of Bury St. Edmunds, entitled "Holder Construction;" and the other by Mr. R. Wardell, of Cambridge, on "The Efficient Running of Gas-Engines." At the meeting, the officers for the ensuing year will be elected. In the evening, the members and friends will dine together in the hotel. The Engineer and Manager of the Peterborough Gas Company (Mr. John Barton) has under construction a gasholder and tank; and he will receive members or visitors wishing to inspect it, or to view the new stoking machinery, &c., at the works.

**Association of Gas and Water Engineers of Saxony-Thuringia.**—It is announced that the fifty-ninth annual general meeting of this Association will be held at Plauen, in Saxony, from the 25th to the 27th inst. The technical communications, which will be taken on the 26th inst., include the following: "Novelties at the Plauen Gas-Works," by the Manager, Herr Jaeckel; "Measurements of Illumination in Streets," by Dr. K. Bunte, of Carlsruhe; "The Use of Gas Coke in Central Heating Plants," by Herr Ohly, of Cologne; "Saline Erosion of the Fire-Brick Walls of Carbonizing Ovens," by Herr Zinck, of Halberstadt; "Advances in Gas Lighting," by Herr Jonas, of the German Incandescent Gaslight Company, of Berlin; "The Determination of Naphthalene in Washing Oil by Hahn's Method," by Herr F. Lux, of Ludwigshafen; and "Two New Charging and Discharging Machines for Horizontal Retorts," by Herr Eitle, of Stuttgart. The last day of the meeting will be devoted to an excursion.

# PRIVATE HOUSE LIGHTING.

The Illuminating Engineering Society, meeting last Tuesday, under the chairmanship of Mr. F. W. Goodenough, had before them the subject of "Private House Lighting"—the electrical aspect of the question being presented by Mr. W. R. Rawlings, and the gas aspect by Mr. W. H. Y. Webber.

### Extracts from Mr. Rawlings' Paper.

The author made a rough division of dwelling-houses into three types: (1) The cottage or artisan's dwelling; (2) the middle-class house; and (3) the mansion, both town and country. He pointed out that the first type—the cottage—being the humblest of the three, has, until recent years, been practically neglected so far as electric lighting is concerned, for obvious reasons; but it is now generally agreed that it offers a promising field for enterprise. The first question is, What installation can be given for the usually limited amount of money available? Moreover, as there is seldom any margin for decorative effect, the illumination is perforce limited to one lamp in each room, fixed at the most useful height near to the centre of the room or beside the window, and with an inexpensive shade to diffuse the light over the room. Apart, therefore, from the fact that it applies to such a large section of the population, there is little to interest the illuminating engineer in this class. As to the middle-class house—while there is, of course, much more demand for increased illumination and decorative effect—there are naturally limitations as to expenditure. He, therefore, passed to the electric lighting of town and country mansions as offering the best examples and opportunities of the highest developments of artistic illumination.

The problem of the illumination of such a house is entirely different from that of an institution, club, or hotel. From the various discussions which have been taking place in this Society and elsewhere, it might perhaps be supposed that the production of artificial daylight is the ideal illumination; but even if such light could be obtained at a low price, it is, in the author's opinion, unsuitable for the home, and should be confined to certain special applications, in cases in which the correct matching of colour, &c., is an all-important item. Mankind craves for variety. When the sun has set, one desires, as a continuation of the light of the departing day, the warm tone which the artificial illuminants of to-day naturally provide. From this standpoint the old carbon filament lamp, with its yellow rays, gives greater satisfaction, and a more pleasing effect, than the white light of the metal filament lamps. Moreover, it may be pointed out that the only result of experiments on "artificial daylight" has been to produce a light which resembles daylight so far as the colours are concerned. But, as in the case of all artificial illuminants, the light emanates from a small point. Two square inches would be a large radiating surface; and even when diffusers are employed, 2 to 4 square feet would be about the limit found in practice. With daylight, however, the area of source of light is far greater than that of the objects to be illuminated; and, even if the light has to pass through a window, the illuminating area is very large compared with artificial sources. After all, it is not, in Mr. Rawlings' opinion, a question whether a similar light to the sun's rays would be desirable, even if a perfect reproduction could be obtained; for it is found, in spite of its limitations, that the majority of people enjoy life as much under artificial illumination as they do under the rays of the sun.

It may be argued that the important point to consider is not what one likes, but what one should use to illuminate the home properly. To this the author replies that people, as a rule, live according to their desires, whether these comply with the proper hygienic conditions of life or not; and by these desires the lighting contractor must necessarily be guided. In some cases, for example, it is found that people do not object to glare. It is the duty of the illuminating engineer to co-operate with the medical profession in teaching these people what is best for their well-being, and, with their skill and knowledge of the subject, so to arrange matters as to give the right and proper conditions of illumination, and yet to meet the consumer's wishes.

What is the the proper amount of light required? Text-books and articles on illumination are to be found answering this question, giving schedules in foot-candles for different parts of the house—such as bedrooms, dining-room, drawing-room, &c. In the author's opinion, the art of illumination in the home is not to illuminate any room equally all over, but to produce the proper light and shade effect, according to the purpose for which it is intended. There is no difficulty in providing a certain number of foot-candles for this or that purpose. The problem of house illumination is not so much one of foot-candles, as of convenience, taste, and personal requirement.

Still, Mr. Rawlings was quite prepared to admit that there is a minimum limit in foot-candles for specific work. For instance, a bedroom is comfortably illuminated with a variation from 0·2 to 1 foot-candle; but the dressing-table, and the part in front of the dressing mirrors, must have at least 6 to 10 foot-candles on the dressing-table surface. But this amount of illumination must be confined to these special positions. A dining-table requires not less than 2·5 foot-candles, and need not exceed 3·5. But the ceiling and walls of the room should be kept from 0·5 to 1 foot-candle, so that the surroundings may be subdued in comparison with the table; and for this reason the author does not advocate here indirect illumination. It is only when the actual illumination for specific work is required—such as for reading, writing, and the illumination of any special objects—that a bright light is desired. The billiard-table, perhaps, provides as good an example as any of this contrast effect. It is well known that while the player likes a strong light on the table, he prefers a lower illumination for the rest of the room. It might, perhaps, have been thought that to illuminate the billiard table properly a volume of light, such as that given by a skylight, would have been desirable; but, as a matter of fact, professionals prefer the method of local illumination.

Mr. Rawlings knows of nothing more uncomfortable than a room equally illuminated on every square foot of the floor; and a room so lighted is, in his opinion, inartistic. He therefore suggests the following rules for illuminating the home:

(1) That a room should not be evenly illuminated all over.
(2) The filament of the lamp should be so placed as not to be in the line of vision under normal conditions.
(3) The position of the light should be so placed as to illuminate specific objects, according to the nature and purpose of the room.
(4) That small units of lights are in general to be preferred.
(5) Indirect lighting should only be used for general lighting, or as supplementary to the necessary local illumination.

The questions of the dimensions and positions of windows, the colours of papers, paints, or ceilings, &c., do not as yet strictly fall within the scope of the contractor dealing with the artificial illumination of the house. The house is arranged with its windows, its style of decoration, and colour-treatment to suit the individual taste of the architect or owner; but the time is coming when the illuminating engineer will also be a party to the arrangement of windows and the selection of the colour scheme. At the present time, this phase of the art is frequently settled without his experience being consulted at all. The engineer is set the task of illuminating the house as he finds it in the best manner possible. The problem frequently assumes the form, not "How best to illuminate the house," but "How the problem can be solved to the satisfaction of the employer and his friends"—most of whom have opinions of their own; and, since they must pay the piper, it is natural they should desire their ideas to be carried out. It is, as a rule, a matter of tact in obtaining more or less a compromise between what is considered correct and what the powers that be insist upon. It is seldom that the engineer is allowed free scope in placing the lights as he in his opinion thinks best; and, in a word, it is more difficult to satisfy the taste of the owner than the actual requirements of the house. Not only do opinions differ as to the fittings, but there is a greater diversity with the individual as to the amount of light required. Some ladies insist upon having a light of 20 to 30 foot-candles on the dressing-table, while another complains that one-fourth this amount is too much, from which it will be readily seen that it is difficult in the case of private houses to specify the illumination in foot-candles, even for a specific purpose. Again, one has to take into consideration the positions of windows and the general arrangement of furniture. In many instances the old positions which were allocated to gas or oil, permanently fixed with a view of being within easy reach, must be retained. For the owner, having adapted himself to the general inconvenience of the arrangement, will insist upon the new lights being in the same position as the old. Many absurdities of lighting to-day are due to this and other causes.

Next Mr. Rawlings mentioned a few points to be borne in mind in illuminating a mansion. The town house requires more light than the country house; the same people who consider a 16-candle power lamp is too strong in the country will complain that a 30-candle power lamp is insufficient when in town. This diversity is one of importance in all lighting problems; and, in his opinion, it plays one of the most important parts in the illumination of houses. Excess of light in the town compels the same fault to be perpetrated in the home; and for this reason the hall and corridors should never be illuminated to a higher degree than the rooms. The effect would be to render the remainder of the lights insufficient by contrast.

[Mr. Rawlings illustrated, by photographs of town and country mansions, some of the foregoing suggestions as to how the present-day house should be illuminated.]

### Extracts from Mr. Webber's Paper.

In his paper, Mr. Webber devoted a large part to leading the members along the paths by which we have come to the present position in the matter of domestic illumination, using gas as the agent. The preface to the portion of the paper dealing with modern conditions constituted the more extensive of the two. In the home, all things are, or should be, subdued and homely. This idea was at the back of the mind of the author in preparing his composition. This being so, it follows that figures regarding foot-candles, zonal distribution, or the initial intensity, &c., are often out of place. We were taken back to the blazing torch of bog pine, and were told that we have lost something in our pursuit of high temperature light besides picturesqueness. We hardly ever talk of the tone of artificial light, except to find fault with it for being different from sunlight. Apart from certain technical or commercial purposes, is this, asked the author, altogether wise? Must we bid farewell to the soft *chiaroscuro* of so many happy memories, and dwell for ever in a restless, if not glaring, north light? The composite candle was introduced; and then the advent of gas was mentioned. In the early days gas was always a

middle-class luxury. It never invaded the marble halls of the west-end; and, of course, the poor could not get it. The flat-flame burner and its appliances then succeeded to place in the paper, together with references to the moderator and paraffin lamps of the period. The work of William Sugg was noticed; and here the author confessed that he was old-fashioned enough to hold the opinion that, for prolonged reading in the seclusion of a library or in the study, the mellow light of a good argand gas-lamp, suitably shaded, is still the most comfortable and innocuous of all means of localized illumination. After this, the Welsbach light was introduced; but the author considered it would be foreign to his present subject to detail the steps and stages through which this method of obtaining light from gas has passed, even for domestic applications. "Suffice it to say that its progress has lain along the two main types of upright and inverted mantle burners, and also that for both the application of distance and *quasi* automatic ignition has proceeded to lengths of convenience and safety unattempted in regard to luminous flame lights."

But there was a rearward movement by the author, and again an innings was given to the flat-flame gas-light, which is "by no means obsolete or even obsolescent." It is the town's safety light, to be trusted to keep watch over all byways, tunnels, exits, stairways, corridors, stables, and cellars. Once lit, always burning so long as needed without any attention. In short, it is indicated for all purposes, and they are many, where illumination is less in question than the showing of a light. The rule of Capt. Shaw of the Metropolitan Fire Brigade is in point in this connection: "On an alarm of fire, turn up all lights." There is a useful fitting for such applications of long standing, though not so well known as it should be. It is called "Breeden's pilot," and consists of a simple push-button to reduce the flame to a glimmer with a touch. This is better than trusting to the lowering of the gas by means of the burner cock, which might put out the light altogether with fumbling handling.

Incandescent mantle burners of all types are comparatively high-pressure appliances. Not that there is any measurable pressure inside the mantle, even in what is called high or increased pressure lights. But the gas pressure is converted in the Bunsen burner into velocity of flow, which is expended in entraining the primary air into the Bunsen tube. Ordinary indoor incandescent burners are most efficient under an acting gas pressure at the nipple of about 20-10ths, and should always be governed or regulated to this by a suitable appliance independent of the burner cock. All burners should be so adjusted to work with the burner cock turned full on. This is essential. No such burner can be properly and reliably regulated by the burner cock, because if this is partly turned off to check the consumption of gas, the pressure at the nipple is also affected, and the Bunsen will not function properly.

Now we come to the portion of the subject that only really matters to-day. The author here said: We can now proceed to deal with the ordinary problem of planning a scheme of gas lighting for a typical suburban middle-class residence, a rent of £40 a year, and is being built all round London every year. The arrangement of this was shown in a plan. First, as to the entrance hall and front door lighting. The conditions necessary to be observed are that the light shall fall on the face of any one approaching the door after dark, while coming from well overhead and behind the person answering the door. If there is a flight of outside steps and a deep porch, it might be advisable to have a light projecting from the fanlight; but with an approach on the level, the disposition shown will suffice. It calls for a medium power inverted lamp, clear underneath in a not too "arty" lantern, which can be controlled by a switch in the wall. This will also light the doorways to the lower apartments and the lower flight of stairs.

For the dining-room, the light must, of course, be concentrated upon the table. Its power will depend upon the size of the apartment and its shape; but it should not be less than 60-candle power. An adjustable pendant is indicated, which, when lowered, will provide ample light for reading by the fireside. It may be stipulated here that old-fashioned gas-fittings for flat-flame burners, including especially the "water-slide" pendant accepted unquestioningly by the past generation, are quite unsuitable for incandescent burners. The increase of gas pressure has rendered the latter dangerous. It can be converted, but is rarely worth it. Modern gas-fittings are lighter and steadier than the old patterns. If preferred, two smaller lights can be put beside the fireplace.

For the drawing-room, scattered small units are best. These can be either bracket lights, or dropped as short, stiff pendants from the ceiling. A wall-light in the garden verandah is appreciated in summer-time; nor is it impracticable to extend the lighting into a shady nook of the garden.

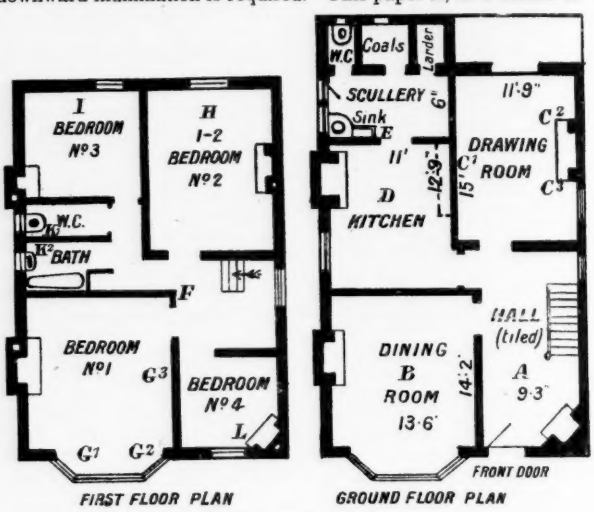
In the kitchen, adequate lighting is necessary. A single pendant high up, or a pair to afford cross-lighting of the kitchener, will be appreciated by the cook. The scullery and back door can be served by a single flat-flame.

On the stair landing, we want a watch-light as well as adequate illumination, and accordingly a flat-flame, with Breeden's pilot for night use, is indicated. The same for bathroom and w.c.

Pendants are most convenient for bed-rooms, as permitting free arrangement of the big furniture. Dressing-tables should have the light coming from overhead, as nearly as possible in the same way as daylight, and cross-lights are preferred. A bed light is a great comfort. Single units will suffice for the smaller rooms.

With all lights full on—a rare occurrence—the total consumption of gas would be about 50 cubic feet per hour. Under the old conditions, it would be more than double for the same number of points. The increased amount of light would be as 4 to 1. It is interesting to note that the ordinary lighting value of the modern unit is about treble that of the common flat-flame. This speaks eloquently of the heightened standard of indoor illumination which has come into vogue with the incandescent gas-light. It could not have originated otherwise, seeing that the colza oil and single-wick paraffin lamp do not give more than 15-candle power; and the contemporary domestic standard incandescent electric lamp was of 8-candle power.

Pleasant household lighting is more a question of proper disposition of the lights than of mere candle power, although the circumstance of having to allow in all cases head-room of 6 ft. 6 in. from the floor is of itself a preventive of the bad placing of the lights too often seen in shop windows, with the naked illuminant in the line of sight. There can be no glare when the sources are well up out of the way. Although ordinary domestic lighting of middle-class dwellings does not permit of much range of fancy in the disposition of the sources, it offers plenty of scope in the modest way for the correct and tasteful choice of fittings and shades. There is seldom use for the more powerful units. If it is a sound rule, as I hold, that the power of units of artificial light should be governed by the scale of the enclosed space to be lighted, then it follows that in the ordinary £40 a year house nothing more powerful than a medium-size inverted incandescent gas-lamp, burning about 2½ cubic feet of gas an hour, and shedding a luminous intensity of between 50 and 60 candle power in the lower hemispherical zone, is likely to be called for in any apartment. And only then if, as in the dining-room, a brilliant downward illumination is required. This paper is, as a matter of




EXPLANATORY NOTES.

| | | | | | | |
|---|---|---|---|---|---|---|
| A | Hall lantern, medium size inverted, | | 2½ | cu. ft. p. hr., | electric | ignition. |
| B | Dining-room, | ,, ,, ,, | 2½ | ,, ,, | hand | ,, |
| D | Kitchen | full ,, ,, | 3½-4 | ,, ,, | ,, | ,, |
| C | Drawing-rm. | "bijou" ,, ,, | 1 | ,, ,, | ,, | ,, |
| E | Scullery | flat-flame | 5 | ,, ,, | ,, | ,, |
| F | Landing | ,, | 5 | ,, (Breeden's pilot) | | ,, |
| K | Bath and w.c. | ,, | 5 | ,, ,, | ,, | ,, |
| G, H, I, L | Bedrooms | "bijou" inverted | 1 | ,, each, electric, pneumatic, [or hand ignition. | | |

fact, being written by the light of such a source, which is ample for a cosy room about 13 feet square, not counting window or sideboard recesses, although the walls are covered with dark brown paper and the furniture is black oak. The ceiling and a deep frieze are white, which is a wonderful aid to light diffusion. When the white table cloth is spread, the brilliancy is quite enough for any one. I always recommend my women folk to spread a white cloth under any "black work" they may do at night.

Personally, I am no lover of indirect lighting by diffused reflection from a white ceiling, although I have secured a very pretty effect by suspending a Japanese umbrella under a ceiling lamp. I certainly do not admire the heavy, solid copper basin reflectors I have seen in use for a similar purpose. Complete opacity in the case of such reflectors is a mistake. To me, however, the shadowless lighting resulting from this treatment of home lights is unsettling to the nerves. I find myself drifting out of such a room to one where I can see the lamp if I want to. I believe that lamps, like other good servants, should be neither in the way nor out of the way.

One other form of light to which I object is the sham candle. I know it is a selling article; but this does not redeem it in my eyes. The real wax candle is a beautiful thing, and good candle light is hard to beat. The colza moderator lamp, too, is elegant, which is more than can be said of most petroleum lamps. I do not admire the stiff, upright incandescent gas-burner, while confessing its serviceability. The inverted incandescent lamp, however, with a well-chosen shade, can claim one's admiration of its form as well as our appreciation of its solid merits; and I am satisfied to leave it at that.

Finally, there is the matter of automatic ignition. I have nothing to add to what has been said by Mr. A. E. Broadberry on distance

igniters, several forms of which are as suitable for house as they are for shop lights. [See "JOURNAL" for Feb. 27, p. 585.]

**Discussion.**

The CHAIRMAN, in inviting discussion, said the members were indebted to both the authors for their distinctly philosophic and literary contributions. There were many human touches in the papers, which were fully up to the standard of the papers that occupied honoured positions in their "Transactions." Mr. Rawlings spoke of the domestic lighting problem being one of convenience, taste, and personal requirement rather than of candle-feet; and Mr. Webber preferred proper distribution of lights rather than mere candle power. Both authors felt it was very difficult to lay down rules in regard to house lighting, because there the human element—the variation of individual taste—applied more strongly than in any other problem of illumination. In Mr. Rawlings' paper, however, there were certain general rules which might be observed with advantage; and Mr. Webber had produced a number of practical suggestions which might be of use to anyone plotting out the lighting of a private house.

Mr. J. DARCH remarked that, looking at the papers generally, though a great deal had been said that was very useful, and was worth remembering, in spite of that, he was greatly disappointed. The papers seemed to be reminiscences of the lighting of twenty years ago. He saw nothing new in them; and there was a complete absence of the principles regarding good illumination which they as a Society had been trying to spread. They began the meetings of the Society with a lecture by an oculist, who laid down some excellent principles. The papers since had been full of physiological suggestions and information which should guide the lighting of all places, whether they were churches or private houses. In all the illustrations given by Mr. Rawlings, it was seen that he did not carry out even his own five rules, which were excellent ones. The first rule spoke of rooms not being equally illuminated. He (Mr. Darch) quite agreed. But they must start with a basis of illumination; and it was proper to begin with an even, general illumination, strengthened by local lighting where necessary. Apart from this, the five rules were excellent; and he should recommend them to anyone who was laying out an installation for the lighting of a private house. But the second rule had been entirely disregarded in the examples Mr. Rawlings had given them. He told them the lights should not be in the line of sight; and in nearly every case that had been illustrated, the lights had been in the line of vision. It did not do to merely use a transparent shade over the light, and then say the light was not in the line of vision. These remarks applied equally to gas and electric lighting. No matter the source, glare that came in the line of vision must be deprecated. Reference had been made to indirect lighting; and it had been described as shadowless lighting. It was nothing of the kind. Indirect lighting approached daylight; but no one thought of calling daylight shadowless. He would not advise its general adoption; but there were many drawing-rooms that might be illuminated by it. Why a person should want to live in a room with the glare of a lamp in front of his face, he could not understand. They must get rid of old-fashioned prejudices. If the Society were to make real progress, they must set aside old-fashioned notions, and not show a series of things which they could see in any house.

Mr. A. P. TROTTER thought that artists and architects no doubt considered it proper to lay down laws and principles; but among engineers he believed they must admit that matters of detail for various purposes were largely questions of taste and of individual predilection. It was therefore difficult to be didactic. There was the question of uniform illumination, of which they heard a good deal. There was a notable example of such lighting in this city. He believed most people thought the lighting of the magnificent hall of the Institution of Electrical Engineers was an interesting failure. Mr. Darch told them that Mr. Rawlings had failed in putting into practice one of his principles. Mr. Darch held that they must begin with uniform illumination, and add to it special illumination. He (Mr. Trotter) ventured to differ. In a private library, for example, they did not want artificial lights to illuminate the whole of the room. For public purposes, they must have at least a minimum of illumination; but in domestic lighting this was not necessary. His own office was by no means uniformly lighted. The desk was well lighted, and the rest of the room was in darkness. These questions were entirely matters of taste. Regarding indirect lighting, this had another meaning, where they got the light partly from a lamp direct and partly by reflection. Semi-direct lighting would probably be a better description. For domestic lighting, he thought this was a very good way. At his own house, he had a number of old French sconces for candle fittings; and he agreed with Mr. Webber in a way that an artificial candle was rather an eyesore. What he and friends of his had done was to put over the candle a piece of brass tube gilded to suit the ormolu of the brass fitting; and though this did not pretend to be a candle, it carried out the idea. Then, in the case of brackets, with a small shade about 3 inches across bent round in front of the lamps, they had sufficient transparency to let through a certain amount of light, in addition to that reflected from the walls. He was at present disappointed with the lighting by metallic filament lamps. He agreed with Mr. Rawlings when he spoke about the yellow rays giving greater satisfaction; and he was also in accord with Mr. Webber as to the old-fashioned mellow light. If an 8-candle power carbon filament lamp gave all the light that was wanted, they were not going to find much economy by using a 20-candle power metallic filament lamp which gave an amount of light they did not want. As to the amount of illumination for domestic lighting, they could not lay down any rules in foot-candles and so forth; and it was really surprising how one could accommodate himself to a small quantity of light. But it was all a matter of personal opinion and taste, though he agreed with Mr. Rawlings that they must try to educate people to better ways.

Mr. J. G. CLARK said it struck him the authors of the papers had confined themselves too much each to one class of house. Mr. Rawlings had dealt with the lighting of town and country mansions; while Mr. Webber had practically spoken of only £40 houses. He (Mr. Clark) personally knew of quite a number of large houses using gas as the illuminant; and he believed that in the lighting of large country mansions (away from town-gas mains) petrol air gas was by no means an unknown illuminant. It was just as well for them, in this matter of the lighting of dwelling-houses, to remember the desires of the consumer, because any attempt to impress scientific principles upon anything that the consumer had set his heart upon would not meet with success. A good way for dealing with private house lighting, and for educating the consumer, would be to have a number of furnished rooms properly lighted, so that the consumer could see, and so appreciate, the conditions obtained by lighting a room in a proper way. Mr. Clark then had thrown on the screen a couple of photographs of drawing-rooms lighted by candle fittings. The fittings were single and double, with light pink shades. He (Mr. Clark) liked the effect very much indeed; and the illumination was something over 2 candles.

Mr. MACKINNEY did not think 1 foot-candle of surface brightness was excessive for private house lighting. With reference to the question as to uniform lighting, he thought there was something which required some qualification. If they took an ordinary dining or sitting room in a middle-class house, they wanted the strongest illumination in the centre of the room and for reading purposes by the fire. In his own dining-room, the illumination on the horizontal plane, 2 ft. 6 in. above the floor-level, ranged from 3 foot-candles to ½ foot-candle near the walls. What they had there was not uniform lighting all over the room, but uniform lighting in the working positions. As to stating the illumination in so many foot-candles in dwelling-houses, this was a method that should be used very carefully in the case of the private householder; but it must be borne in mind that if there was a case where one was on the border-line of obtaining the order, actual facts as to what one's illuminant would do were of great importance.

Mr. LOVINSON remarked that one frequently came across houses of the lower middle class in which the illumination was most abominable; and, with very little instruction, a great deal could be done to better these conditions. He had asked himself whether people who lit their homes according to their own devices did not sometimes fare very badly; and it would be a very good thing for them if they could go to some illuminating engineer, and get good advice at a very low price. [Laughter.] In regard to gas lighting, it was a pity that the available pneumatic and other means of distance lighting were not better known. Much could be made of these contrivances in actual use; so much so that he believed gas lighting had nothing of which to be ashamed as against electric lighting. He considered a lot could be done in regard to guarding the eye from the actual glare of lamps. At the present time, as a general rule, one saw too much metallic filament, and too much incandescent mantle. The more they were covered, the better and healthier for the eye.

Mr. HAYDN HARRISON said the lighting of dwelling-houses was a problem that they as illuminating engineers were never allowed to discuss seriously, except among themselves. He had been called in at different times to advise people as to the lighting of their houses. They would let him advise them so far as the means were concerned; they would let him advise them as to the position of switches; but when it came to the position of the lamps and the types of fittings, did they think these people would permit him to advise them? Not a bit of it. And, what was more, he had not for the past seven years asked them to let him do so. If anybody came to him, and told him how he was to light his house, the person would get a hot reception. Personally, he was not going to attempt to give rules for private lighting; and if people liked to make themselves blind, he did not see why they should not do so. [Laughter.] Even were rules laid down, he doubted very much whether they would become common. As tot he lighting of billiard tables, he noticed Mr. Rawlings always had six lights over them; but he (Mr. Harrison) had found out, and it was absolutely true, that a billiard table ought to have eight lights. They would never light a table well with six. He supposed the six came about because there were six pockets. With eight lamps, even distribution could be obtained, and the lamp shades could be kept out of the way. There was one point as to the drawing Mr. Webber put on the screen, he noticed in one house he provided three different means of control for the gas-lamps—electric, pneumatic, and hand control. By hand control, did he mean a bye-pass burner, or a hand-lighted burner? Seeing there were two types of automatic control in the £40 house, he wondered why Mr. Webber put in the hand control.

Professor MORRIS observed that this matter of private-house lighting was almost entirely a question of taste; but there were one or two principles that could be observed in connection with it. If they considered the lighting of a room that was illuminated

from the centre, they found there were a number of advantages and disadvantages. One of the advantages was that it was possible for people to work in any part of the room, and get a reasonable amount of light on their work. A disadvantage was that, if one was reading or writing with one's face towards the centre of the room, one got reflection from the surface of the paper into the eyes; while if one turned round, and there were a number of people doing the same thing in the room, it looked a very unsociable gathering. Another advantage of lighting from the centre of the room was that "if it was desired to re-arrange the furniture, there was no incapacity so far as the lighting was concerned, such as there was with bracket lighting. He agreed with certain speakers that the horizontal illumination in a room should not be equal. If one was working, one wanted to be able to look away to various parts of the room where there was a lower illumination; or if one was conversing with a friend, it was not desirable to be looking at a uniformly illuminated surface. He had been discussing this matter for some years with friends; and he had come to the conclusion that for pleasant lighting, one wanted a considerable amount of variation. Accepting this, one was forced to illuminate the room from the sides; but rooms differed as to the manner in which they were best illuminated. He quite agreed, in regard to the lighting of entrance halls, that they should not be so brilliantly illuminated as the rooms, because it produced a feeling of depression to pass from a brilliantly lighted hall into rooms poorly lighted.

Mr. GASTER remarked that Mr. Harrison had stated that he would not dare to advise a client on certain matters; but in his experience, he (Mr. Gaster) had found that clients were not devoid of common sense. The client expected them to tell him what to do—what was right and what was wrong, the amount of illumination required, the position of illuminants, how to avoid glare, and so on. The type of fittings that he adopted they need not trouble much about. What they had to do was to arrange them in certain positions. The point was important as to what a poor man was to do who found wiring or piping already in his house. It was very essential that those who put the wiring or fitting into a house should study a little more the modern conditions of the users of the lamps.

On the proposition of the CHAIRMAN, the thanks of the meeting were conveyed to the authors of the papers.

Mr. RAWLINGS, in reply, said Mr. Trotter, like Mr. Webber, did not like imitation candles. But he should like to call attention to the fact that these were French designs; and France did not appear to have had any recent fittings designers born. So they had continued the line of fittings which were originally designed for candles. It was a good suggestion of Mr. Trotter's to use tubes to screen the candles, though they would still be conscious that the candles were inside them. Mr. Trotter made it clear that a smaller light sufficed in the country, though in London it was a very different thing. Mr. Lovinson suggested that an illuminating engineer was not a cheap individual with whom to deal. He (Mr. Rawlings) had not found the illuminating engineer a very expensive man up to the present. Professor Morris and other speakers in the discussion had confirmed the view that it was impossible to lay down any golden rules for the illumination of rooms. Domestic lighting was rather a problem of tact than of foot-candles.

Mr. WEBBER, also in reply, said he was strongly of opinion that this was not a branch of illuminating engineering in which it was a question of talking too much about foot-candles. The public did not understand anything of the sort. If they had in mind the amount of light that was convenient and suitable for reading, writing, or working, he did not think they need give everybody the details of their prescriptions. They had heard a good deal about glare. But no one had said anything about spottiness. Was spottiness a form of glare, or was it not? He would not pause for a reply. Much, of course, depended upon the background with which one had to deal. It was almost a modern rediscovery that, if one had a bright light against a white background, the glare of it was destroyed; but at the same time the measurable intensity was increased if they were going in for foot-candles. What they did, however, was to altogether destroy the spottiness; and uniformity of effect was produced. It was his experience that uniformity, not of lighting necessarily but uniformity of effect, was far less likely to annoy the eye than the spottiness such as they had overhead in the meeting room. The bright candles of which they had been speaking ought to stand against a white, or nearly white, background. If they were going in for direct lighting, a reflecting surface should, generally speaking, be behind.

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**London and Southern District Junior Gas Association.**—A meeting of the Association will be held at the Westminster Technical Institute next Friday, when Mr. S. B. Chandler, of the South Metropolitan Gas Company, will read a paper upon "Gas Supply," and, if time permits, the subject of the "Formation of Shadows" will be introduced by the President (Mr. J. G. Clark). On Saturday, May 11, there will be a summer meeting at Margate, which promises to be very successful. Ladies are particularly invited to take part in the visit, which will include an inspection of the works of the Isle of Thanet Gas Company, and subsequently high tea at the Imperial Hotel, on the invitation of the Directors of the Company. Then on Friday, May 24, the annual general business meeting of the Association will take place.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Annfield Plain and District Gas Bill, Church Stretton Urban District Water Bill, Dunstable Gas and Water Bill, Egremont Urban District Water Bill, Fleetwood Gas Bill, Windermere District Gas and Water Bill.

## HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read the third time and passed: Belfast Water Bill, Birmingham Corporation Bill, Church Stretton Urban District Water Bill, Dunstable Gas and Water Bill, Egremont Urban District Water Bill, Fleetwood Gas Bill, Gas Companies (Standard Burner) Bill, Windermere District Gas and Water Bill.

The Bognor Gas Company have presented a petition against the Electric Lighting Provisional Orders (No. 1) Bill, in respect of the Bognor Electric Lighting Order.

The second reading of the National Electric Construction Company's Bill, which, it may be remembered, provides for the confirmation of a number of agreements with local authorities, under which the latter charge an additional sum per unit and collect it from the consumer, afterwards passing it on to the Company, stands for next Thursday; but notices of motions for the rejection of the Bill have been given by Mr. Abraham, Mr. Bennett-Goldney, Mr. Brady, Mr. Clancy, Mr. Cotton, and Mr. Nannetti.

### The Suggested Royal Commission on Co-Partnership.

In accordance with notice, Lord Robert Cecil asked the Prime Minister last Tuesday whether he had received a memorial, signed by 293 members of the House, asking for the appointment of a Royal Commission on co-partnership; and, if so, what decision the Government had come to on the point. Mr. Asquith said he had received the memorial referred to, and the proposal should have the careful attention of the Government, who for some time past had had under consideration the question of industrial unrest and its causes. Lord R. Cecil asked the right hon. gentleman whether he could give any indication as to when the Government would be able to look into the question; and Mr. Asquith asked him to put his question a little later. His Lordship gave notice that he would repeat the question next Thursday.

## GAS COMPANIES (STANDARD BURNER) BILL.

This Bill came before the Unopposed Bills Committee of the House of Commons last Tuesday. It is promoted by the following Companies: Ashton, Brierley Hill, Dudley, East Grinstead, Folkestone, Gravesend and Milton, Horley, Portsea Island, Redhill, Rugby, Southend, Stroud, Sunbury, Sutton, and Whitby.

Mr. G. C. COOPER (Messrs. R. W. Cooper and Sons, the Agents for the Bill) said the object of the measure was to enable the Companies named to adopt the modern standard burner for testing the illuminating power of their gas in lieu of the burners prescribed in the Acts or Orders relating to the various undertakings. It was the practice now in all Gas Bills, whether a company was being incorporated or whether Parliament was reviewing the powers of an existing company, to insert the Model Clause dealing with the standard burner; and it was in order that the Companies named might bring themselves into line with the trend of modern legislation that the present Bill was promoted.

The CHAIRMAN (Right Hon. J. H. Whitley) asked whether the following paragraph in clause 2 was in the Model Clause: "The standard burner means the 'Metropolitan' argand burner No. 2, described by the Metropolitan Gas Referees in their Notification for the year 1908 (a model of which burner has been deposited with the Warden of the Standards), or any other burner which the Board of Trade may approve under the provisions of this Act as being equally or more suitable for the testing for illuminating power."

Mr. COOPER said it was taken from the Standard Burner Act of last year. The object was to prevent the necessity for the Companies coming to Parliament again in order to substitute some other burner which science might in the future discover, and which might be more satisfactory than the burner now prescribed. Some of the Acts and Orders of the Gas Companies concerned already contained a provision that the burner should be the particular burner prescribed, or some other burner hereafter prescribed by the Board of Trade; and these Companies had had no difficulty in getting another burner substituted by the Board without applying to Parliament. In this way the paragraph in question was in the public interest as much as in that of the Companies.

The CHAIRMAN also asked whether the Companies concerned in the Bill were all under the sliding-scale. Were they all on the same basis—that as they cheapened the production of gas part of the benefit went to the consumer?

Mr. COOPER replied that some were maximum-price and others sliding-scale companies; but in the case of the former, part of the benefit of the cheaper production of gas would go to the consumer, provided the company were paying the maximum dividend at the time the change was made. He also pointed out that the authorities had in every case had proper notice of what the Bills contained. In last year's Act, no consideration was given to the local authorities, on account of the change, by maximum-price companies; it being laid down by Parliament that it was only right and just for the companies to be allowed to adopt the burner.

The preamble of the Bill was then proved; and it was reported without amendment.

## BIRMINGHAM CORPORATION BILL.

### Land for Gas-Works Extensions.

This Bill, promoted by the Birmingham Corporation for the purpose, among other things, of acquiring further lands in connection with their gas undertaking, which was under consideration last week by a Committee of the House of Commons presided over by Sir E. CORNWALL, was sent forward for third reading on Friday.

Clause 14, in Part IV., deals with the gas undertaking, and gives the Corporation power to take some 36 acres of land on the River Rea, close to the Aston and Stechford branch of the London and North-Western Railway, for the purposes of additional works in connection with the gas undertaking. The clause states that the Corporation may "do all such acts as may be proper for making and storing gas, and for supplying gas, and may make, store, and supply gas accordingly, and may manufacture, sell, provide, supply, and deal in, coke, tar, and all other residual products or refuse of any materials employed in, or resulting from, the manufacture of gas."

There was no opposition; but the Local Government Board, in a report upon the Bill, made the following comments upon this clause:

> The Board observe that no borrowing power is proposed for the purchase of lands and erection of gas-works under clause 14 of the Bill, and presume that the Corporation propose to raise, with the Board's approval, any loans which they may require for that purpose under section 15 of the Gas Act, 1875, and the Consolidation Act, 1883.
>
> The Board point out, however, that while they have power under these Acts to sanction loans for the purpose of the gas undertaking, they are not empowered to prescribe any period for the repayment of the loan—a period of 80 years from the date of borrowing being imposed by section 25 of the Act of 1875. The Board are aware that the Corporation are making provision for the extinction of loans which have been sanctioned by them within a much shorter period than that allowed by the Act of 1875; but they suggest that section 297 (4) of the Act of 1883, so far as it relates to section 15 of the Act of 1875, should be repealed, and that provision should be made in the Bill to enable the Board to sanction loans for the purposes of the gas undertaking, and prescribe a period for the repayment of any loans so sanctioned.

The Corporation agreed to the suggestion made above; and a clause to this effect has been inserted in the Bill.

## FYLDE WATER BILL.

### HOUSE OF COMMONS COMMITTEE.—Thursday, April 18.

(*Before Sir* CHARLES ROSE, *Chairman, Mr.* STANIER, *Mr.* ALBERT SMITH, *and Mr.* BIRD.)

The Bill promoted by the Fylde Water Board, for sanction to construct additional works and make better provision in regard to their undertaking, came before the above Committee to-day.

Mr. BALFOUR BROWNE, K.C., Mr. FITZGERALD, K.C., and Mr. TYLDESLEY JONES, appeared for the promoters. The opponents were represented: Blackburn Corporation and West Riding County Council by Mr. C. C. HUTCHINSON, K.C., and Mr. JEEVES; Preston Corporation, by Mr. VESEY KNOX, K.C., and Mr. SQUAREY; Ribble Conservators and Lancashire and Ribble Joint Committee, by Mr. JEEVES. Counsel were reserved by remaining opponents.

Mr. BALFOUR BROWNE explained that the Board was constituted in 1897; the authorities concerned being the Blackpool Corporation, and the Councils of Fleetwood, Lytham, and St. Annes-on-Sea. The Board's present drainage area was 207 square miles; and in addition to the four towns mentioned, there were 42 smaller townships, with whom there existed some 75 agreements for the supply of water. The total water supply given by the Board had increased from 3,180,292 gallons per day in 1901 to 4,355,681 gallons per day in 1911. The present works consist of two reservoirs—viz., the Barnacre and Rizedale reservoirs—while the Rizedale Lea reservoir was under construction, and would be completed in about two years' time. As a matter of fact, a larger supply of water could be obtained from the area; but the enormous difficulties encountered in building additional reservoirs rendered it impossible to further develop the present drainage area. In 1911, something approaching a water famine was experienced; and the Board's Engineer reported that it was essential to find further supplies. After consideration, it was decided that the best spot was to take water from the area drained by the River Hodder in the Easington and Croasdale Fell district. Here it was proposed to construct four reservoirs—viz., the Stocks reservoir, the Hesbert reservoir, the Greet reservoir, and the Croasdale reservoir. These works would involve the construction of 28½ miles of aqueduct. The total yield from this new source of supply was put at 24,851,690 gallons; and deducting compensation water, the net amount was calculated at 16,567,793 gallons. The new works would, it was estimated, suffice for the needs of the area of the Water Board for about sixty years. The estimates showed that the cost of land and the construction of reservoirs, roads, diversions, &c., would be £1,334,835, and for the construction of the aqueducts £404,720. There were no engineering difficulties. All the riparian owners had been settled with. The chief opponents were the Preston and Blackburn Corporations, the Ribble Conservators, and the Lancashire and Ribble Joint Committee. Negotiations were proceeding, and clauses would, in all probability, be agreed with the Lancashire and the West Riding County Councils and the West Riding Rivers Board. The London and North-Western Railway Company had been settled with. Dealing with the petition of the Preston Corporation, Counsel said that the chief point of it was that the proposed works would take away water from the River Ribble and prevent scouring action between the Preston Corporation dock and the sea. Thus the Corporation wished to prevent a large population from securing an adequate supply of drinking water in order that the water might be used for scouring the River Ribble, when the sea at present performed this function quite well. The Blackburn Corporation opposed on the ground that they have a water drainage area adjoining the area taken in the present Bill, and that they would be injuriously affected thereby. But it was pointed out that no works had yet been constructed by the Blackburn Corporation in this district. Their powers were obtained in 1877, and extensions of time had been granted until 1931. On the other hand, under agreements with the landowners, the Fylde Water Board were bound to construct one reservoir at once. The remaining petitions were not referred to; Counsel being reserved in most cases.

### Friday, April 19.

On the resumption of the proceedings this morning,

Mr. *J. Bickerstaffe* (the Chairman of the Fylde Water Board), Alderman *J. Heap* (a member of the Board), and Mr. *C. Arthur* (the Secretary) gave evidence with regard to the exigencies which had prompted the Board to go forward with the scheme. It was admitted that the present drainage area would give a larger supply than that dealt with by the existing reservoirs; but geographical difficulties rendered the construction of further works on the site an impossibility. Suggestions were put to the witnesses in cross-examination that the Brock area, adjoining the present drainage area, would afford an excellent supply of water at a cheaper cost than would be the case under the scheme proposed, and, further, that it would not interfere with existing rights of other authorities, such as Blackburn and Preston. The reply in all cases, however, was that the water in the Brock area had been found to be impure. It was pointed out that the Liverpool Corporation, in 1875, after making trial bore holes, abandoned the Brock area for this reason; and since then no one had ever suggested constructing a reservoir there. On the financial side, it was sought, in cross-examination, to prove that it was an improvident scheme; but the Chairman interposed with the remark that this was hardly an aspect of the case which would affect the ratepayers of Blackburn or Preston. Other questions were directed to the matter of inspection of gauges; but the Water Board strongly resented every party concerned in the matter having such rights. They were, however, willing that one only should be delegated to carry out such inspection. Powers were taken in the Bill to supply in bulk to district councils on the route of the aqueduct; and already an agreement had been made with the Bowland Council for such a supply. This was following the precedent of Manchester, Liverpool, and Birmingham; and, as a matter of fact, under the powers possessed by the Manchester Corporation, an arrangement was come to last year, at the time of the drought, for a supply to be given to the Fylde Water Board from the Manchester Corporation aqueduct from Thirlmere, which passes through the Fylde area. The Fylde Water Board anticipated, and were quite prepared for the necessity of, levying a rate-in-aid in respect of the new scheme; but their view was that additional supplies of water must be obtained, no matter the cost.

In answer to the CHAIRMAN, the Secretary of the Board, who suggested the possibility of a sixpenny rate, stated that the present gross profit—that was, before meeting capital charges—amounted to £50,000. The sum of £1,800,000 would have to be raised under the Bill, the interest upon which would be £63,000, or, including sinking fund, about £72,000; and this additional revenue would have to be obtained from the increased supply which was anticipated. In other words, the present daily supply of 4,355,000 gallons would have to be increased to 10,000,000 gallons in order to meet capital charges, although, as was pointed out, the capital would only be issued from time to time, and not all at once.

## Defrauding the Oxford Gas Company.

At the Oxford City Police Court last Tuesday, Arthur Sammons was summoned by the Oxford Gas Company for fraudulently abstracting gas on April 5 and 6. Defendant, it was stated, was a plumber and fitter; and after there had been some trouble over the payment of accounts, the meter was removed from his house at his own request. The Company believed that a deliberate fraud had been committed for a long period after that time; but it was only recently that they secured sufficient proof to authorize them going into the house. Evidence was given as to the finding of a rubber tube connecting the inlet main with the house pipes, and of a gas-ring being burning in a locked shed. Defendant said he did not know the meter had been taken away by the Company; and his son admitted that he made the connection without his father being aware of the fact. He had been warming a greenhouse with gas for five or six weeks. The fines and costs imposed by the Bench amounted to £4 7s.

## Sales of Stocks and Shares.

Messrs. A. & W. Richards found there was exceptionally strong competition for all the gas and water securities they had to offer at their sale at the Mart, Tokenhouse Yard, E.C., last Tuesday, which included three issues of new capital by order of Directors. The first lots consisted of £8000 of 5 per cent. consolidated stock and £5300 of 4 per cent. perpetual debenture stock of the Uxbridge Gas Company. The former, which will carry dividend at the rate of £6 2s. 6d. per cent. as from the 1st prox., was all sold at from 123 to 125¼, and the latter at from 95 to 96¼, per £100 of stock. Next came an issue of new ordinary £10 shares in the Southend Water Company, ranking for a maximum dividend of 5 per cent., but entitled to 4½ per cent.; and they were placed at par. The Broadstairs Gas Company offered £3000 of ordinary "D" stock (7 per cent.), and £1000 of 4 per cent. perpetual debenture stock. The former fetched from 130 to 132, and the latter from 97½ to 98, per £100 of stock. As the dividends on these stocks have been paid free of income-tax, the distribution is respectively equivalent to £7 8s. 6d. and £4 5s. per cent per annum less tax. The remaining lots were some original ordinary consolidated "A" stock of the Bognor Gas Company, ranking for a standard dividend of 5 per cent. per annum, but carrying 5¾ per cent.; and they were sold at from 110¾ to 112½ per £100 of stock. At a local auction sale last week, £600 of ordinary stock of the York United Gas Company sold for £90 11s. per cent.

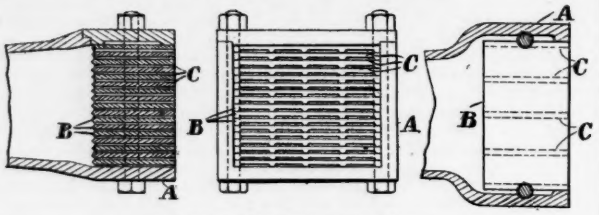
# REGISTER OF PATENTS.

## Burners for Gas-Fired Furnaces.

KEITH, J. & G., of Farringdon Avenue, E.C.

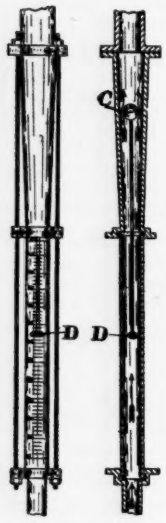
No. 8480; April 5, 1911.

This invention relates to a burner of the kind in which the burner-head is fitted with ribbed or grooved or spaced plates, whereby the outlet, which is of fairly large area, is distributed over a large number of small orifices of considerable length in relation to their cross sectional area. The invention contemplates the provision of such a burner-head in conjunction with a venturi tube, and provides an improved arrangement for holding the plates in position.




**Keith's Gas-Fired Furnace-Burner.**

In the illustration (a longitudinal section, an end elevation, and a horizontal section of a portion of the burner), the burner comprises a venturi tube of the usual proportions fitted with an air regulator at the inlet end and having at the outlet end a large head A (preferably of rectangular section, as usual). The head is fitted with plates B, ribbed or grooved or spaced, so as to afford a number of narrow passages C between the plates. The ends of the plates absorb a considerable amount of heat from the flame and from the heated portions of the furnace in the immediate neighbourhood, and as they present a large surface for the absorption of heat, the heat is conducted and transferred to the gas and air mixture as it flows through the passages; thus tending to keep the plates cool and preheating the mixture to a certain extent. The walls of the burner-head are fitted with fins engaging with recesses in the plates; and a lid or cover, forming one side of the head, is screwed up tightly to secure the plates in position by means of bolts, which engage with recesses in the walls of the head and with other recesses in the sides of the plates.




**Schultze's Current Velocity Measurer.**

## Measuring the Velocity of Gases Flowing through Pipes.

SCHULTZE, G. A., of Charlottenburg, near Berlin.

No. 15,532; July 4, 1911.

This invention refers to a device in which a vertically expanding conically shaped tube with a ball-like float is used to measure the current velocity of fluids, vapours, and gases flowing through pipes—the quantity of gas or fluid flowing through per second being indicated on a scale.

The measuring device consists (as shown) of a conically expanded tube and of a part C arranged in it, and connected by a wire with an indicator D. The gas or fluid to be measured flows through the pipes in the direction of the arrows, and forces up the body C in the conical tube to a certain position, which releases a definite passage. The position of the body is read off on the indicator D, which is moved on the interior of a glass tube along a scale which can easily be read off. The glass tube and the conically expanded tube are held together by bolts and connected by flanges to the pipe supplying the gas.

## Distilling or Melting Bituminous Materials.

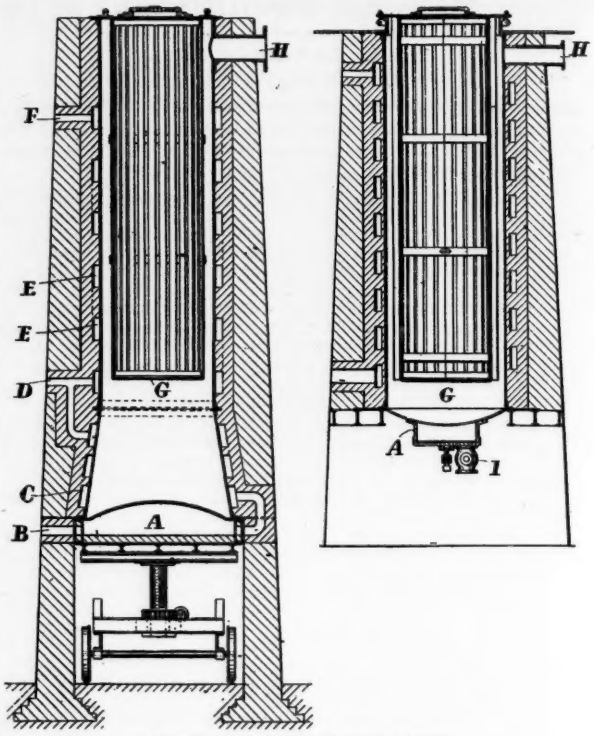
W. C. HOLMES AND CO., LIMITED, and HOWELL, H., of Huddersfield.

No. 12,599; May 25, 1911. No. 22,746; Oct. 16, 1911.

This combined invention relates to the melting and distillation of bituminous materials.

As is well known, the patentees remark, that if such a material is subjected to great heat in the initial stage of its treatment, so large a volume of gas is immediately evolved as is very difficult to deal with. According to this invention, the material is subjected to a process of slow melting in a cage or basket within the retort, from which basket the melted bitumen trickles out, and may then be exposed to increased heat.

The apparatus employed comprises a vertical retort, the upper portion of which has preferably perpendicular sides, and into which is lowered a cage or basket, which may be in the form of a long cylinder, composed of metal rods, laths, or angle-iron bars, containing the material to be treated. The basket is of such proportions and is so suspended as to remain in a position equidistant from the inner surface of the retort on all sides; in other words, the basket is concentric with the retort and of less diameter, so that a space is left between the basket and the hot wall of the retort.




**Holmes and Howell's Bitumen Retort.**

In the first arrangement shown, the bottom door of the retort is in the form of a box A, and means are provided whereby the incandescent gases from the producer can be led through the hollow interior of the door. For example, a flue or duct B may lead the hot gases first to the hollow interior of the door, whence they pass through spiral or other grooves C, around the lower part of the retort, to the flue D, where a small additional supply of gases is admitted. The combined stream of gases, gradually cooling in its ascent, then passes through grooves E, widely spaced apart, around the upper portion of the retort to the outlet F.

The basket G being charged from an overhead bunker or travelling hopper, the bitumen melts to the consistency of treacle and flows out of the basket, falling on to the bottom door, where the greater heat gradually drives off the gas, which passes through the outlet H to the hydraulic main, leaving a coke residuum on the door A. On the completion of the operation, the door is lowered (say) by means of a screw rotating with a worm wheel driven by a worm actuated by a handle (not shown). The door and lowering mechanism may be mounted on a carriage, on which the coke may thus be taken away. On the same or another door being placed in position and luted, the next charge can be fed into the basket.

In cases where the gas and coke necessarily produced are merely regarded as bye-products (as in the extraction of bitumen from Italian bituminous limestone), the hollow door may be dispensed with—the retort being then constructed as shown in the second place. In this modification, the sides of the retort are perpendicular throughout, and are uniformly heated to a moderate temperature—say, 400° Fahr. The gas and vaporized oil pass off by the outlet H. The bottom door A, instead of being in the form of a box, may be dished and provided with a valve I, through which the fluid bitumen can be run off into a mould or other receptacle as it drops from the basket.

## Gas-Meters.

WRIGHT, A. C., HANSFORD, J., and FROST, A. C., of Witton, near Birmingham.

No. 890; Jan. 11, 1912.

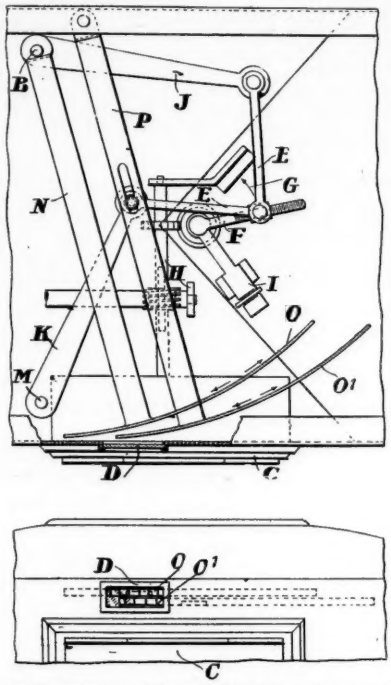
This device for gas-meters is adapted to indicate the fact that consumption or leakage (too small to be apparent on the ordinary registering dials) is occurring on the consumer's side of the meter.

In the illustration, C is an ordinary consumption register dial; and D, an aperture in the wall of the meter casing, having a transparent front behind which the leakage-indicating device moves in a reciprocating manner. E are radial arms pivotally mounted on the arm F of the crank-shaft, which is turned by the measuring chamber diaphragm in the direction of the arrow G. The parts H and I, together with the tangent arms J and K and the parts E and F, constitute known mechanism for actuating the consumption register—the device I being for preventing the rotation of the crank arm in the non-registering direction should attempts be made to tamper with the meter.

The arms J K are each pivotally connected at one end to the arm E and at the other end are mounted on a flag-rod L or M. N is a bar fixed at one end to the flag-rod end of the arm J. It carries at its other, or free, end a curved indicator band O, in such a manner that, as the flag-rod L oscillates and the crank-shaft and the corresponding arm E turn, the lever N will, by reason of its attachment to the arm J, carry its band O to and fro past the aperture D. The band is preferably graduated, so that a very slow movement of it may be the more easily detected.

A bar P likewise carries at one end a curved indicator band $O^1$; but the bar is pivotally attached to a flange of the casing, and is provided,

intermediate of its ends, with a slot, and is correlated with the arms E and K. The arm P, as it rocks about its pivot (in consequence of the motion imparted to it), carries its band $O^1$ to and fro behind the aperture D. During the oscillation of the bars N and P, there will be moments when one or other of the bars will be momentarily stationary; but the




**Wright, Hansford, and Frost's Leakage-Indicating Meter.**

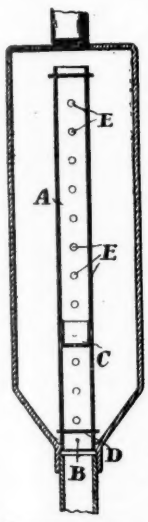
periods when one bar is stationary will not occur simultaneously with the periods when the other bar is stationary. Consequently, whenever any gas at all is passing through the meter, one or other of the bands will be in motion behind the aperture D.

## Device to Regulate the Pressure of Gas.

BURNS, E. J., of Chicago, U.S.A.

No. 27,158; Dec. 4, 1911.

In operation, the device shown is to be connected to one end of the outlet connection of the meter and the opposite end to the house piping—the device being positioned so that the tube A extends vertically. The gas, on entering the tube, flows through the bye-passes B into the outer casing, and thence to the house pipes. When all the fixtures are turned off, the member C is resting on the pin D at the lower end of the tube—just above the bye-passes; and the flow from the tube into the casing is, therefore, through the bye-passes only. There is thus always gas in the house pipes and fixtures, so as to ensure immediate ignition when turning on the fixtures. When more gas is being used than can be supplied by the bye-passes, the opening of additional jets allows a greater pressure on C, causing it to ascend high enough in the tube A to expose sufficient openings E to supply the amount of gas required. Upon turning off any of the fixtures, C will descend in the tube a sufficient distance to cut off enough of the openings to reduce the amount of gas and allow the flow of just enough to supply the remaining lighted fixtures. When all the fixtures are turned off, and no gas is being consumed, the member C descends in the tube until it rests on the pin D, thus shutting off the entire flow except that which is through the bye-passes. Thus it will be seen that the turning on or off of any of the fixtures has a direct effect on the position of the member C in the tube, and causes it to move up or down in the tube. As to this all-important member C, the patentee remarks: Of course, it will be understood that the regulating member must be of just the required weight to move downwardly as the consumption of the gas is curtailed, and to move upwardly under the action of the gas pressure as the flow is increased.




**Burns's Gas Pressure Regulator.**

## Testing the Viscosity of Tar.

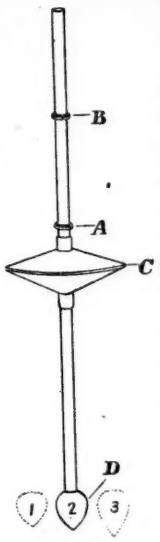
HUTCHINSON, J., of Tothill Street, Westminster.

No. 22,042; Oct. 6, 1911.

In estimating the suitability and value of coal tars and other bituminous materials for use in making roads, an important test in the examination, the patentee points out, is that for viscosity, "which property may be taken as indicating the binding power, as well as the consistency or 'body' present." When scientific accuracy is required, instruments based on the velocity of issue from a small orifice, the tubular portion of which may vary in length and diameter, are used. But the instrument which is the subject of the present invention is based on its velocity of immersion in the liquid under test, which has been found to give results sufficiently accurate for the practical purposes of the highway engineer or road maker.

The principle of estimating viscosity by velocity of immersion is not new; and an instrument based on this principle has been proposed. But it labours under the disadvantage that the test commences when the lower end of the instrument touches the surface of the liquid; and this is attended with the liability of the instrument to assume a slanting position, which must be righted—thus delaying, and to that extent invalidating, the result. To overcome this fault, the inventor proposes to fix the commencement at a point when the instrument has sunk in the liquid sufficiently far to ensure the maintenance of its perpendicularity.

The instrument illustrated consists of an upper stem with rings at A and B, which act as marks for the test. C is a bulb. D is a poise—one of three, interchangeable.




**Hutchinson's Instrument for Testing the Viscosity of Tars.**

The test commences at the ring at A on the stem, and ends when the instrument has sunk to the ring at B. Thus the bulb will have been wholly immersed, and the instrument have acquired a steady downward movement, before the commencement of the test. The time occupied by the instrument in sinking from one to the other of the marks constitutes the result of the test.

The test is taken as follows: Having filled a vessel of cylindrical shape, not less than 9 inches in depth and 4 inches in diameter, inside measurement, to within $\frac{3}{4}$-inch to $\frac{1}{2}$-inch of the top, with the material to be tested, it is thoroughly stirred and its temperature and specific gravity taken. The instrument is then placed so that it sinks in the centre of the vessel, and the time taken by it in sinking from the ring on the stem marked A to the ring above marked B is carefully observed—noting the time in seconds or minutes and seconds. The longer the time occupied by the instrument in sinking from A to B, the greater the viscosity present in the material.

With regard to the influence which the variations in specific gravity may have on the test, the action of the instrument may be illustrated as follows. Assuming the variations to be from specific gravity 1·170 to 1·240 in materials like "prepared" coal tars, the influence, when using No. 2 of the three poises at D, would be about 5 per cent., *plus* or *minus*, or say an error of one-twentieth, which for all practical purposes of the road engineer may be considered sufficiently accurate. If greater accuracy is deemed necessary, poise No. 1 for tars with a specific gravity ranging from 1·170 to 1·195 is used; poise No. 2 for tars with specific gravity ranging from 1·195 to 1·215; and poise No. 3 for tars with specific gravity ranging from 1·215 to 1·240. The influence, with its consequent error, is then reduced to less than 2 per cent.

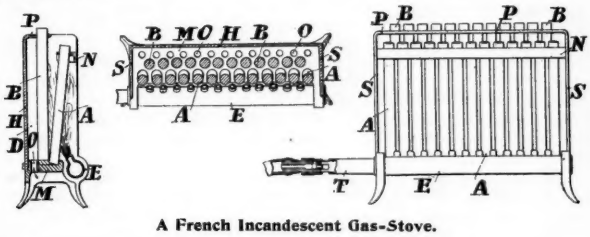
In making tests (especially comparative tests), it is necessary to keep in mind that bituminous materials are very susceptible to changes in temperature—this is particularly the case with coal tar—and that the viscosity present decreases considerably with a rise in temperature and increases to a similar degree by a fall.

## Incandescent Gas-Stoves.

SOCIÉTÉ FRANÇAISE DE CHALEUR ET LUMIÈRE, of Levallois-Perrot, France.

No. 20,727; Sept. 19, 1911. Date claimed under International Convention, Oct. 28, 1910.

This incandescent gas-stove has radiating members (of permeable refractory substances of cylindrical or other form) brought to a state of incandescence by means of flames of gas; and it consists in an improved arrangement of the refractory radiating members, which are arranged in rows behind one another from front to back—the members of one row being preferably staggered with respect to those in an adjacent row.




**A French Incandescent Gas-Stove.**

The apparatus comprises two rows of rods A B. The front row is inclined forwards; the back row is vertical. The rods in one row do not touch each other; there being space between them which may vary according to the size of the rods and the power of the jets of flame. It may be about 4 mm. for rods of 12 mm. diameter. The rods have their lower portions fixed in openings arranged in the plate M, which serves as the base or support for the whole arrangement; and their upper portions pass through plates N and P, in the same horizontal plane, but at different heights, so as not to obstruct the space between the two rows—a space which serves for the escape of the products of combustion. At a certain distance behind the row B rises an enamelled plate H, which is connected with the plate P in a manner to form a chamber D, closed at the top and into which air enters through holes O. The two side walls S, reflective or enamelled, complete the apparatus.

In front and below the range of rods A is the burner E, which con-

sists in a longitudinal chamber perforated with openings, so as to form an inclined row of jets directed with a slight inclination on to the rods. The burner is connected with the bunsen T. The distance between two consecutive gas-jets is equal to the distance between the axes of two rods.

The air which enters the rear chamber D passes between the rods of row B, by contact with which it is heated, and "causes complete combustion of the gas," for not only do the rods of the first row A become incandescent, but also those of the row B; so that in the diverging space between the two rows there is "complete combustion, accumulation, and concentration of heat developed, from which there is a powerful radiation of heat."

## APPLICATIONS FOR LETTERS PATENT.

8360.—Brierley, R., "Water-pipe systems." April 9.
8412.—Marks, E. C. R., "Gas burners." A communication from F. W. Gault, jun. April 9.
8429.—Cohn, S., "Mantle making." April 9.
8435.—Hueckel, R., "Gas-engines." April 9.
8469.—Lord, J. E., "Lamps." April 10.
8474.—Debrie, V., "Controlling gas-valves." April 10.
8486.—Rogers, F., "Pyrometers." April 10.
8492.—Earl, G. G., and Wood, A. B., "Fluid meters." April 10.
8507.—Boogaerts, A., "Distillation of coal." April 10.
8513.—Chandler, D., and South Metropolitan Gas Company, "Gas-heated irons." April 10.
8607.—Milbourne, R. J., and Cottrell, W., "Providing access to the crown or other desired part of a gasholder." April 11.
8647.—Toogood, H. J., and Robert Dempster and Sons, Limited, "Sealing the lower aperture in vertical retorts." April 12.
8658.—Milne, J., "Compressing gas." April 12.
8691.—Prosser, H. R., "Burner regulators." April 12.
8712.—Soc. Anon. des Combustibles Industriels, "Conversion of coal tar, petroleum, residues, creosote, and slate oils, and the like, into pitch." April 12.
8713.—Huguenin, A., "Compressors." April 12.
8739.—Terry, G., "Burner galleries." April 13.
8796.—Spreadbury, R. J., "Controlling gas-burners." April 13.

## Weighing Machine at the Wolverhampton Gas-Works.

The Wolverhampton Gas Company have just had placed at their works one of the most up-to date makes of automatic weighbridges. It has a capacity of 40 tons; and the platform measures 16 feet in length. Owing to special requirements, loads under 20 tons are weighed by divisions of 1 cwt., and above that weight by 2 cwt. divisions. The great advantage of the machine over ordinary weighbridges is that a steady motion is given to the indicating finger, and trains of trucks travelling at from two to three miles an hour can be weighed—provided the wheel bases of the trucks are suitable. The underwork is supported by a massive iron framing, strengthened by vertical ribs; and arrangements are made for supporting the girders and rails when the weighbridge is dismantled for cleaning or repairs—thus maintaining the roadway. The principal wearing parts in this class of machine are the knife edges. These at Wolverhampton are of specially prepared high-quality steel, machined dead to gauges, and are interchangeable. The dial which automatically indicates the load is entirely without springs; neither does water nor any other fluid play a part in the indicating of the load. By the movement of a hand-lever, the dial mechanism can be relieved from all loads when the weighbridge is not required for weighing.

**Gas-Works Extensions at Darlington.**—A Local Government Board inquiry was held by Mr. R. H. Hooper at Darlington last Thursday, into an application by the Corporation for sanction to borrow £47,550 for the purposes of gas-works extensions. The Town Clerk (Mr. H. G. Steavenson) explained that the application was practically a repetition of one made in April, 1905. It was now proposed to erect a different type of retort-house, and equip it in a more up-to-date manner. The Corporation did not proceed with the original scheme, as it was found that, by expending £3000 to £4000 on the then existing retort-house, certain economies could be effected, which would delay for some years the necessity for the larger extensions. Since then considerable changes had been made in the methods of carbonization, which enabled the Council to now put forward a scheme which it was hoped the Board would have no hesitation in approving, as the saving which it would be anticipated would be effected in working would be sufficient to pay interest and sinking fund charges on the additional capital expenditure.

**Birkenhead Gas Undertaking.**—In moving the adoption of the estimates of income and expenditure at a special meeting of the Birkenhead Town Council, Alderman G. S. Oldam (the Chairman of the Finance Committee) said the Gas Committee had transferred £12,000 to the borough fund, which was equal to a rate of over 4½d. in the pound; and the Electricity Committee had given £1500 in aid of the rates. Mr. Dodds remarked that all the trading concerns were in the nature of monopolies, and so ought to return substantial profits. The Gas Committee's assets stood at £457,937; and the net profit, after paying interest and sinking fund charges, was £2 12s. per cent. per annum, despite the fact that the Committee had charged 20 per cent. more for gas than Wallasey. The grant of the Electricity Committee in relief of the rates was equal to 18s. 7d. per cent. per annum. He asked whether any private undertaking would rest satisfied with a return of this kind. Mr. Willmer described the Gas Committee's contribution to the rates as a "mere pittance," when taking into consideration the amount of money involved. In reply, Alderman Oldam pointed out that the gas undertaking made a total profit of 8·33 per cent. on the capital outlay, when interest, sinking fund, depreciation, and surplus sums carried forward were taken into account; while the profit of the electricity undertaking represented 6·35 per cent.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## The Heating Efficiency of Gas-Circulators.

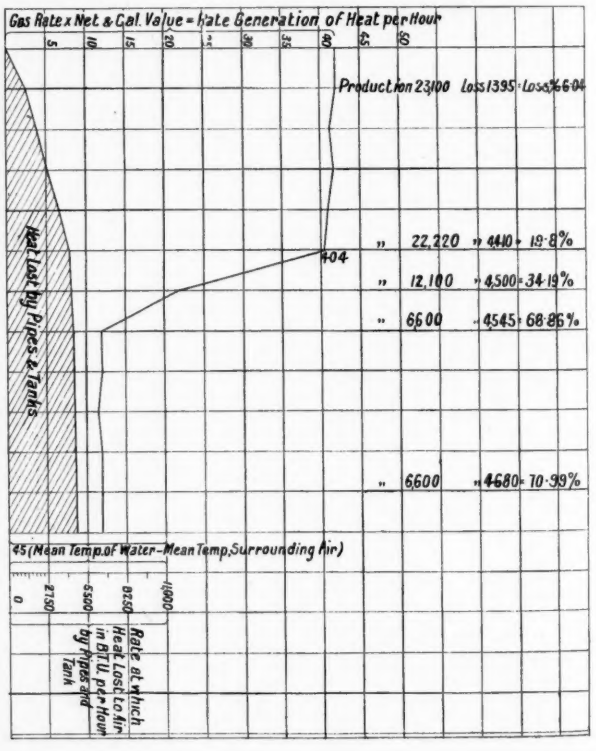
Sir,—We have read with interest the remarks passed by "Experimenters" in their letter on the above subject published in the "Journal" for March 26, and find ourselves not wholly in agreement with their contentions. We should like therefore to be allowed to give our views upon this matter, as it is one that has occupied a considerable amount of our time and attention.

We are in agreement with the writers in that it is impossible to conceive of a circulator in practice connected to a system of tank and connecting pipes giving return as hot water 97½ per cent. of the total heat generated; but before proceeding, we should like to say a few words on the subject of 97½ per cent. It is imperative that it be definitely stated as to whether this 97½ per cent. efficiency is calculated on the net or the gross value of the gas. The average calorific value of gas supplied by one of the large London Gas Companies is 487 B.Th.U. per cubic foot net and 546 B.Th.U. per cubic foot gross. Thus 97½ per cent. efficiency would represent, if calculated on the gross value, a return of 532 B.Th.U. per cubic foot; or of 474 B.Th.U. per cubic foot if calculated on the net value. If the calculation is made on the net value, and is representing a return of 474 B.Th.U. per cubic foot as already mentioned, this return shows an efficiency of 86·8 per cent if calculated on the gross value of London gas.

This matter we have mentioned to emphasize the effects which can be brought about by calculating in the two methods mentioned, and to show the absolute importance of definitely stating the method of calculation used.

The question of statement of efficiencies by makers of gas-heated circulators is one of considerable importance, and no small amount of difficulty; and as a result of very careful consideration, we cannot bring ourselves to agree with "Experimenters'" contention that the results actually obtained from an installation in an average house, which he puts at 60 to 70 per cent. working efficiency, represents the real efficiency of the gas-heated circulator. This is not the case. It represents the efficiency of the installation as a whole, under conditions which are far from standardized, the variations of which have a far-reaching effect upon the results obtained; and we are of opinion that there are circulators upon the market capable of giving 97½ per cent. net efficiency, when tested in such a manner that the efficiency of the circulator itself is given in the result—not the circulator efficiency diminished by the deficiency of the circuit to which it is attached.

To emphasize the point just raised, we would like to draw attention to the accompanying diagram, which represents a graphic statement




of the total heat generated, from which is deducted the losses per hour from the tank and pipe surfaces, of an installation which we recently tested. The system was heated by a gas-fire circulator of high efficiency, and satisfactory results were being obtained. In the diagram, the top curve represents the rate of generation of B.Th.U. per hour, and is obtained in the following manner.

The state of the meter was taken every 15 minutes, and the consumption for that 15 minutes noted. The rate per hour was then multiplied by the calorific value of the gas; and the curve plotted. The area beneath the curve represents the total B.Th.U. generated during a three-hours test, during the latter portion of which time it will be seen the generation of B.Th.U. per hour was greatly reduced by the action of the thermostatic valve. The lower curve represents

the rate at which heat is being lost by radiation and conduction from the surfaces exposed. The generation of the lower curve is arrived at in the following manner. Every 15 minutes the average temperature of the water in circuit was taken, also the average temperature of the air surrounding the system, from which the difference in the temperature of the surface and the surrounding air was obtained. This figure was multiplied by 15—the superficial area of the tank and pipes; the result being again multiplied by three. This was found to be the quantity of heat lost in British thermal units per hour per square foot of surface per degree of difference in temperature between the surface of the surrounding air—the temperatures being taken on the Fahrenheit scale. Stated more briefly, this generation was as follows :—

$(T - T') \times S \times 3$ equals loss of heat in B.Th.U. per hour.
T representing temperature of the surface, degrees Fahrenheit.
T′ „ „ of the surrounding air.
S „ the superficial area of the surfaces in square feet.
3 „ the quantity of heat lost per hour per square foot, per degree of difference.

When considering this bottom curve, it will be seen that at first, when the temperature of the water is low, the loss per hour is small. At the end of the first 15 minutes, it represents only 6 per cent. net on the total heat generated. As the temperature of the water rises, the loss of heat per hour steadily increases; and in 75 minutes 4410 heat units were being lost from the surfaces per hour, representing 19·8 per cent. net of the total heat being generated.

The thermostatic valve then came into operation; and 15 minutes later, owing to the reduction and the consumption of the gas not being accompanied by a reduction of the average temperature of the water, 34 per cent. net was being lost. Fifteen minutes later, owing to a still further reduction in the gas rate, the loss had risen to 68·8 per cent. At the end of the test, it was representing a steady figure of 70·9 per cent. loss. From this it will be seen that the loss from the surfaces of the tank has a continually changing percentage, depending upon a large number of conditions—only being constant when the temperature of the water is maintained at a given temperature over and above that of the surrounding air, by the consumption of a fixed uniform gas rate of uniform calorific value. A fluctuation of any of these conditions has an immediate effect upon the percentage of heat lost per hour. Taking the conditions prevailing at 75 minutes, and assuming that the efficiency of a circulator and system as a whole under these conditions is 65 per cent. net, there is being lost from the surface 19·8 per cent. of the heat generated. This heat must obviously have found its way into the circuit, *vid* the circulator; and if the total efficiency of the circulator is to be obtained, this at least must be added to the efficiency of the circuit as a whole—bringing it up to 84·8 per cent.

Again, we must add an allowance for losses by evaporation from the water, as this represents the loss of heat which must have been transmitted to the water from the circulator, which in practice we believe represents approximately 5 to 7 per cent. of the heat generated. Assuming the lower figure, we have now obtained 89·8 per cent. efficiency for the circulator on a theoretical basis. The flue losses under practical working conditions, with a fairly strong chimney draught, would probably represent 10 per cent., finally accounting for 99·8 per cent. of the heat generated, of which 89·8 per cent. would actually be absorbed by the circulator, whereas the efficiency of the whole installation has only been assumed at 65 per cent. calculated on the net value of the gas throughout.

These figures are the results of tests actually taken of a modern gas-fire circulator, which gives well over 90 per cent. efficiency when tested independent of the circuit, and under the most favourable conditions—particular attention being paid to the pull on the flue, which has a very considerable effect upon the final efficiency.

In conclusion, we should like to state that it would be decidedly an advantage if standard conditions could be set down for the testing of all circulators, so as to give as a result the actual practical value of each circulator for supplying a stipulated quantity of water per day in given quantities at stated times. The difficulties, however, of securing such conditions, and the large number of fluctuating factors each of which has a distinct bearing upon the result obtained, in our opinion render it almost impossible to reach this desired object; and we think it would be better to state the absolute efficiency of the circulator only, calculating on the net calorific value of the gas, stating the exact conditions under which the test was carried out, when a definite percentage of efficiency is claimed.

DAVIS GAS-STOVE COMPANY, LIMITED.
*Luton, April* 20, 1912. H. N. DAVIS, Managing-Director.

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**Charters Towers (Queensland) Gas and Light Company.**—In the six months ended the 31st of December, the working of this Company showed a balance of £1177 on the gas revenue account and of £130 on the electric lighting account; and a sum of £3498 was available for distribution. At the ordinary general meeting, the Chairman (Mr. John Tilley) mentioned that the stocks of coal, fittings, and electric fuel had been increased by about £150, and the bank overdraft reduced by £1634. For the past twelve months, the gross profits amounted to £2647, of which £1150 had been written off for depreciation. The Directors' report and the statement of accounts were adopted; and a dividend of 6d. per share for the year was declared.

**Embezzlement by a Meter Inspector.**—At the Lancaster Quarter Sessions on the 9th inst., Frank Bainbridge, inspector of gas-meters for the Morecambe Corporation, pleaded guilty to embezzling various moneys on dates between September and November last. Accused was committed early last month, as reported in the "JOURNAL" for the 19th ult. (p. 814). The prosecution alleged that by means of duplicate receipt-books he had collected money from prepayment meters, given receipts to the householders, but had not handed the money over to the Borough Accountant's Department. After he had left Morecambe, it was discovered that there was a deficiency of £74 on his round. Prisoner's counsel denied that he got more than £10; and he called the Rector of Morecambe, who gave Bainbridge an excellent character. The Bench bound him over in £50 for twelve months.

# MISCELLANEOUS NEWS.

## IMPERIAL CONTINENTAL GAS ASSOCIATION.

### Half-Yearly Report.

At the Half-Yearly General Meeting of the Association on the 7th prox., the Directors will present the following report, which is accompanied by the accounts, on the results of the Association's operations in the six months ended Dec. 31, 1911.

The profit of the half year was £275,453 18s. 11d., which, together with the sum of £45,745 12s. 9d. brought forward from the previous half-year's account, makes a total of £321,199 11s. 8d. available for appropriation, as compared with £288,578 3s. 3d. on Dec. 31, 1910.

The Directors recommend a dividend for the half year ended Dec. 31, 1911, of 4½ per cent., less income-tax.

A further sum of £20,000 has been charged against the revenue of the half year under review for the purpose of writing-down the value of the 2½ per cent. Consols which represent the reserve fund. This fund is now represented by £500,000 of 2½ per cent. Consols, standing in the books at 80.

The total output of gas in the various towns directly supplied by the Association showed an increase of 2·87 per cent.; and the number of consumers was greater by 8·27 per cent.

The total number of meters in use at the close of the half year was 574,001, of which 152,661, or 26 6 per cent., were prepayment meters. At the end of December, 1910, the total number of meters was 532,356, of which 138,506, or 26 per cent., were prepayment meters.

The total length of mains laid up to the 31st of December last was 2480 miles—an increase of 59 miles since June 30, 1911.

The plant and mains at all the stations were maintained in an efficient condition.

The quantity of coal carbonized in the half year under review was 514,831 tons; the average gross cost having been 17s. 6·6d. per ton, or 4·6d. per ton less than in the corresponding half year.

Although somewhat better values were obtained for both ammonia and tar, there was a marked reduction in coke prices, with the result that the net cost of coal worked out at 1d. per ton more than in the corresponding half year.

At Antwerp, contracts were concluded, until 1945, for the exclusive supply of gas to the communes of Aertselaer and Linth, lying to the south-west, and with the commune of Hollandsch-Putte, situated to the north of the city. The alterations at the central office in the Place de Meir, referred to in the last report, were completed.

At Berlin, the new bench of vertical retorts on the Mariendorf works was also finished.

At Brussels, a new contract was concluded with the commune of Erps-Querbs, situated on the north-east side of the city, by which the Association secures a monopoly of the supply of gas and electricity until the year 1948, and the existing contract with the commune of Watermael-Boitsfort was prolonged for four years (until 1940). The new 3 million cubic feet gasholder on the Forest works was completed and put in action; and the twelve settings of vertical retorts on the same works—the commencement of which was mentioned in the last report—were also put in action. Progress was made with the construction of an electricity sub-station in the commune of Etterbeek.

At Flushing, a contract was concluded with the commune of Rittem, an outlying district situated to the east of the town, by which the Association secures a monopoly of the supply of gas until 1962. The enlargement of the show-room and offices was completed.

The contract with the Municipality of Hanover, which would have expired in 1925, at which date the works were to have been handed over to the Municipality free of cost, was prolonged until 1950. Progress was made with the construction of the new works in Linden.

On Dec. 31, 1911, the contract with the Municipality of Vienna for the supply of gas to the suburbs, as also the contracts with Floridsdorf and other communes on the eastern side of the Danube, came to an end, and the Association's operations there were discontinued.

The Directors who go out of office by rotation are Leonard Rodwell Wilkinson, Esq., Hon. Sir Edward Chandos Leigh, K.C., K.C.B., and John Horsley Palmer, Esq. These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office by rotation is Theodore Bromhead Bassett, Esq., who is eligible for re-election, and offers himself accordingly.

## THE SELLING SIDE OF THE GAS BUSINESS.

### Defence of the Gas-Meter by Mr. F. W. Goodenough.

At the Eleventh Meeting and Dinner of the Sales Managers' Association, held at the Holborn Restaurant last Thursday, an address on "The Selling Side of the Gas Business" was given by Mr. F. W. Goodenough, the Controller of the Sales Department of the Gaslight and Coke Company.

Mr. Goodenough remarked that the gas company of to-day was run in a very different spirit from that prevailing ten or fifteen years ago. For this they had to thank their friends the electricians, who had stimulated them to greater activity than they might otherwise have displayed. The modern gas company not only had to convince the public that it was not a grasping and tyrannical monopoly, but it had to break down a prejudicial disposition to regard the official on the same hostile plane as the tax or the rate collector.

Every man on his Company's staff was specially trained to regard it as a fundamental principle that the amount of his wage and bonuses depended solely upon the degree of satisfaction which the Company gave to the public. They considered satisfactory service to the consumer as more important than the price of gas. They could sell more gas at 2s. 6d. per 1000 cubic feet with an efficient service than they could at 2s. if the service were bad. Their policy to-day was always

to get into personal contact with each of their customers and prospective customers, and to advise them honestly as to the most economical method of gas lighting, cooking, and heating. If a company wanted to sell more gas, they must persuade the customer to consume less for each particular purpose for which he was using it. Extravagant gas appliances were the worst enemies a gas company could have.

In the course of his address, Mr. Goodenough made an interesting defence of the gas-meter. He said a careful test of 100 meters had shown that 50 per cent. were correct, 25 per cent. fast, and 25 per cent. slow; but, owing to the mechanism of the meter, the gas company gained very much less on the fast meters than they lost on the slow ones. He knew that a public used to the jokes of comic papers would not believe him, but he assured them that a gas company lost far more on inaccurate meters than they gained. Moreover, the law of the realm was also on the side of the consumer; for Parliament had decided that a tested meter which registered 3 per cent. slow was to be considered accurate, while a meter which registered 2 per cent. fast was not to be so regarded.

## AGITATION AMONG LONDON GAS WORKERS.

### A Movement to Strengthen the Union.

A Meeting of the National Union of Gas Workers and General Labourers was held at the Public Hall, Canning Town, on Sunday, the 14th inst.—Mr. W. CHAPMAN in the chair—"for the purpose of encouraging greater organization among gas workers to deal with matters affecting their general position."

The CHAIRMAN having briefly stated the object of the meeting,

Mr. JACK JONES said there was at the present time a growing demand in all the London gas-works for organization; and already there had been received from the south side—especially from the men employed by the South Metropolitan Gas Company—invitations to start reorganizing at their works as well as in those on the north side of the river. Consequently, so far as the Union were concerned, they hoped before many months were over to restore the organization to what it used to be in days not far distant. Some of the gas-works in the immediate neighbourhood of the meeting-place had been very well organized; and, as the result, the employers had been approached for the purpose of bringing about improved conditions. The employers had been pleased to meet them so long as they did not bring in their Trade Union officials—"outside parties," as they were called. But these were the men who represented the organization of workers; whereas the "inside" men represented the shareholders. The Union were not at present in a position to compel the employers to recognize them; but they hoped that within a very short time they would have greater power in this direction than they had had before. A new spirit was coming over the labour movement; and, instead of dealing with one section of men as had been done in the past when there was any trouble, the employers would have to deal with the whole body of workmen who were directly or indirectly concerned with what might happen. The Union had just as much right to send anyone they pleased to represent them, as the gas companies had to deal with the Union through their officials. Proceeding to refer to various matters of which the men complained, the speaker mentioned that in one works oil was being used on rubbish to produce gas, which the men at Beckton would not stand eighteen or nineteen years ago. Then as to the agreements which had to be signed, he said he was informed that the men were not given an opportunity of understanding them. There were men at the Beckton works who during the last few months had not liked to go to the branch and join the Union, but wanted to send their money through other parties. As showing the difference between organized and unorganized men, he mentioned that at some of the gas-works in the North of England the men had, by their organization, accomplished a great deal without co-partnership or any of the other schemes the people in London had introduced with the view of smashing up the men's organization. He deprecated as being detrimental to the interests of the workers the gradual absorption of the small gas undertakings by the principal one in London, as it would mean the centralization of gas production, and the closing-down of works. Coming to the subject of the increased cost of living, the speaker declared that the general tendency of the prices of commodities to rise was due to the fact that the capitalists were better organized than ever. Men who were employed in gas-works had a commodity to sell—viz., their energy; and they had to preserve it. They could not do this by cutting each other's throats; nor could they play the employers' game, because they would not be thought any the more of for it. The only people who could take care of their interests were themselves, by doing the same as the companies—looking after their organization. He ventured to suggest that if the Union could get the men at all the gas-works to take an intelligent interest in their own welfare, they would, before many months, be in a position to approach the Gas Companies to stop the invidious distinctions between the various grades of workmen, prevent some of the driving adopted by certain of the officials, and have the workmen taken into consideration whenever any alterations in the conditions of employment were suggested. He appealed to all who had not joined the Union to do so. They were arranging for holding meetings all over London, and hoped, before many months had passed, to cover the whole of the area, and by this means bring back to the old state of efficiency the organization of the men employed by the London Gas Companies.

Mr. HARRY PICKARD said he was pleased to find that at last the gas workers of London were beginning to recognize the futility of attempting by Individualism to improve the conditions of their labour. They were beginning to understand the method they had to adopt to bring about a betterment of the conditions of their economical and industrial lives; and they were going to put into operation the example set by the employers themselves. Sectionalism, so far as Trade Unionism was concerned, was dying out. Organization, and this alone, was the only weapon workmen could use for making their lives better and brighter than they were.

Alderman WILL THORNE, M.P., remarked that when, just about twenty-three years ago, they were organizing in probably a more efficient way than any body of men had been before, they had very full reports in the gas papers of what they were doing in different parts of the country. He did not think anything had been said at the present meeting to which exception could be taken. It was very gratifying to him, and to all who were concerned with the Union, to see that the gas workers of London were beginning to recognize their responsibilities towards the organization which did so much for them many years ago. Ever since it was formed, the Union had done what it could to bring about better conditions for the gas workers. The doctrine then preached was that they, the railway servants, the colliers, and all who were engaged in the seafaring industry, should form one huge amalgamation, so that in the event of one section of workers being attacked the others should come to their assistance, morally or financially, with a view to co-operation; and the doctrine had been preached ever since. Of late, work had been speeded-up. The profit-sharing business had been extended not only to gas workers, but also in engineering shops as the premium-bonus system; but neither one nor the other had improved the material condition of the workers in the slightest degree. As a matter of fact, he was not quite sure that it had not told against them—indeed, he was certain that it had. Where profit-sharing had been introduced, the men had been speeded-up, and had done a great deal more work than before, but had not been paid in proportion. Moreover, they were depriving at least some men of work, as the more coal they had to carbonize, the fewer men were required to produce the same quantity of gas. It had been stated by Mr. Jones that the directors of the gas oompanies were not prepared to meet the officials of the Union. He remembered the time when they were only too anxious to meet them; and so they would be again, as soon as the men became scientifically and perfectly organized. The gas workers of London were responsible for starting the new Trade Union movement; yet while in all other towns throughout the country the men were just as solid and united as ever they were, in London they had not kept together. In conclusion, Mr. Thorne expressed the hope that many of those present who were outside the Union would reconsider their position, and come back to it.

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A meeting of a similar character was held last Sunday morning at Bromley, under the chairmanship of Mr. W. ANDRADE.

The CHAIRMAN, in explaining the object of the meeting, said that when they saw the tyranny exercised over the employees in some gas-works, the conditions under which the men worked, and the great bonus system which was being adopted, they had come to the conclusion that the best way in which the employees could defend themselves was to join an organization. Moreover, it would be necessary for them to join some recognized society in order to obtain the benefits of the State Insurance scheme; and he thought they could not do better than become members of a trade organization.

Mr. JACK JONES said every man who followed trade matters intelligently knew there was a growing feeling among all sections of workers to recognize that the time had arrived when they should do something in their own interests. The employers of the country were never in a greater state of alarm than they were at the present time, because the new movement had taken hold of the workers in all the industries. With regard to the gas-works of London, the men had to a great extent left the Union; but they were gradually being brought back. An increasing number of them were beginning to see that a fatal mistake was made when they broke away from their organization. The gas companies in various parts of the country, being alarmed at what was happening, began to offer bribes to the men to keep them quiet. The men accepted these slight concessions as instalments of long-delayed justice. But what had happened within the last few weeks? In spite of the offers made, they found that one large Company in London had cut down by 1s. a week the wages of some of the workers. They realized that if this was allowed to develop, it would not stop at these particular men. He was pleased to say that, so far as some of the workers were concerned, they had recognized this; and in some gas-works in London the men were as well organized to-day as ever they were. But they were being kept back by the others. Referring to the profit-sharing system, the speaker said what happened was that, owing to the speeding-up process, and the setting of man against man for the purpose of keeping his job, they increased the total output of the works, and they took part of the increased output; but they did not share in the original profits of the Company. It seemed inevitable that, sooner or later, there would be a *rapprochement* between the larger Companies, and this would mean that the smaller works would be shut down and production concentrated on the principal stations; and, consequently, loss of employment would follow. They wanted the workers to recognize that, if they wished to take steps in the direction he had indicated, the present was the time; and they must see that better conditions of employment were established. If they were organized as they ought to be, strikes would become unnecessary; and if the men had behind them the determination they should have, they would only have to go to their employers and say: "The time has arrived when we think we ought to have a greater share in the prosperity of the country; and if we are not going to get it, we are going to paralyze the whole industrial system."

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**Gas Profits in Aid of Rates at Southport.**—Mr. George Lloyd, the Borough Treasurer of Southport, recently issued his annual report, upon which the rates for the ensuing year are levied. The total borough rates are 2d. higher (4s. 10d., as against 4s. 8d.); but as the poor-rate is likely to be 6d., instead of 7d, in the pound this year, the net increase in the rates will be 1d. For 1912-13, the estimated expenditure is £164,341, to which has to be added the Water Board's precept of £12,110; making a total of £176,451. The estimated income includes £13,000 from gas profits, and £1000 from the Electricity Department. Last year the Gas Committee made a net profit of £13,401, and contributed £13,000 in aid of the rates—carrying forward £401. The estimated income from the Gas Department this year is therefore about the same as last.

## GAS PROFITS IN MANCHESTER.

### Proposed Contribution Equal to £50,000.

The Gas Committee of the Manchester Corporation had under consideration, at a meeting held last Wednesday, the question of the amount to be handed over out of profits in relief of rates. It was eventually decided that a sum equal to £50,000 be contributed, the same as last year; but in a different way. Instead of £50,000 in cash, a sum of £39,340 is to be given, and the charge for street lighting reduced by £10,660. This means that gas will be supplied for street illumination at cost price.

Mr. W. Kay (the Chairman of the Gas Committee), in furnishing this information, said the department had had a very successful year, chiefly on account of the improved receipts for residuals. But having regard to their heavy commitments, the probable increase in the price of coal, and the desire of members of the Committee to give consumers cheaper gas, they could not see their way to make any increased contribution to the rates this year. The Gas Committee felt that the demands of business consumers should have some consideration, and that the time had come when the price of gas should be considerably reduced, so as to enable the Committee to compete with other illuminants. In the coming year, the Gas Committee had to face increased charges, not only for coal and stores, but for labour.

It is of interest to note that the Electricity Committee's proposed contribution in aid of rates this year is £19,013, or £5500 less than was given last year, and represents 1 per cent. on the outstanding mortgage debt of the department. The Committee intend to spend on capital account £74,000, compared with £57,571 last year.

The Finance Committee of the Corporation met on Thursday, and referred the estimates of the various departments to a Special Sub-Committee for consideration and report. An effort is to be made, as was the case last year, to get the trading committees to make larger grants in relief of rates than now proposed. It is generally agreed that an increase in the city rate is inevitable.

## BIRMINGHAM GAS SUPPLY.

### A Record Consumption.

It was stated at a meeting of the Birmingham Corporation Gas Committee, which was held on Monday of last week, that, as far as the late coal strike was concerned, the trouble was over.

The Committee were, it was added, getting coal in under contract, and were no longer buying in the open market, though various consignments which had been purchased in this way while the strike was in progress were still coming in. The Committee were now in a position to supply some coke to manufacturers, consequent upon an increased production of coal gas in place of water gas. Throughout the trouble they had not increased the price of coke, but had sold whatever they had to dispose of at the same prices as had obtained during the past twelve months. The Committee hoped to be in a position to resume the normal street lighting by the following Saturday; and the City Surveyor already had discretionary powers in the matter—that was to say, if there was any place where he felt there should be extra light it would be provided. The coal coming through was sufficient not only to meet all present requirements, but to allow some to be placed to reserve at all the gas-works. Manufacturers who used gas for power purposes were now receiving the ordinary service. On the previous day (Sunday), there was an increase of 1½ million cubic feet in the consumption of gas, compared with the corresponding Sunday of last year. This was probably accounted for by the fact that a great many people were still short of coal, and were making more extensive use of gas for heating and cooking purposes.

The strike had not, it was said, affected the year's consumption; and the Committee's expectations as to the output being a record had been realized. For the twelve months ended March 31, over 8000 million cubic feet of gas had been consumed, which represented an increase of about 5 per cent., as compared with the previous year, and constituted a record.

## INNSBRUCK MUNICIPAL GAS-WORKS.

### Annual Report—Results with Horizontal Carbonizing Chambers.

In the course of the report of the Innsbruck gas undertaking for the year 1911, reference is made to the gas-making results obtained with the horizontal carbonizing chambers or ovens in use at the works since the latter part of 1909 [*vide* "JOURNAL," Vol. CX., p. 231].

It will be remembered that the whole of the supply of gas is produced in these large chambers. The average make per ton of Saar coal during the past year has been 12,022 cubic feet of gas at 60° Fahr. and 30 inches. *Apropos* of this figure, the report states that the local authorities are not aware that such a high make on the average of a year's working has been obtained anywhere else with any other system without steaming. The gross calorific power of the gas, as the mean of 986 determinations, was 611 B.Th.U. per cubic foot tested at 60° Fahr., and 30 inches. The calorific valuation figure was therefore 7,345,442 B.Th.U. per ton of coal. The illuminating power of the gas consumed in the Elster argand burner at the rate of 5·3 cubic feet per hour, averaged, in 255 testings, 15·32 hefners (13·8 candles). The mean specific gravity of the gas was ·496, and the proportion of carbonic acid present in it averaged 2·40 per cent. The proportion of nitrogen in the gas ranged from 2·2 to 6·2 per cent.; being on the average about 4 per cent. The Tyrol Aeronautical Association have become a valuable customer of the works. The last portion of the gas produced during the carbonization of a charge is collected in a special holder for the purpose of filling balloons. It has an average specific gravity of ·402.

The wages for manufacture, purification, and distribution amounted to 2·3d. per 1000 cubic feet, as against 3·5d. per 1000 cubic feet in the year 1909, when ordinary retorts were in use. The water-gas plant was not used during the year; and the total make of gas amounted to 140,754,390 cubic feet, which is an increase of 5·62 per cent. on the make for the previous year. The bye-products obtained, stated in percentages by weight of the coal carbonized, were as follows: Coke, 71·34 per cent.; tar, 5·70 per cent.; sulphate of ammonia, 0·91 per cent. The coke consumed in heating the chambers amounted to 12·88 per cent. by weight of the coal carbonized, or 22·85 lbs. per 1000 cubic feet of gas made. The carbonizing chambers stand in the open; and it is remarkable that during the whole year there were only six cases of exhaustion affecting two stokers, and aggregating only 17½ days of sick leave. In the old retort-house, as many days of sick leave frequently occurred in one week. In regard to the working of the chambers, it is reported that it took place throughout the year without any interruption. Not the slightest approach to failure of the discharging of the chambers has occurred during the two years they have been in use. There have been no obstructions from thick tar or naphthalene, and the use of naphthalene extracting washers has been dispensed with. The ascension pipes require to be burned out once a day.

## AN INTERESTING PRESENTATION.

Mr. J. D. MacDonald, who for a good many years now has represented in Manchester and the North of England the Cowan Branch of the well-known firm of Parkinson and W. & B. Cowan, Limited, was on Saturday evening entertained at the Eccles Town Hall at a complimentary dinner by his friends, on the occasion of his leaving England for Australia to take up with the same house the position of Assistant-Manager and representative for the whole of the Colony, with headquarters at Sydney. Covers were laid for over 100; and the assembled company, including, as it did, leading men connected with the civic and social life of the borough of Eccles and surrounding townships, as well as representatives of the gas engineering industry, was a remarkable testimony to the popularity of the guest of the evening, who has resided in the Monton district for over twelve years. Mr. G. H. Anderson presided over the gathering, and was supported by, among others, Rev. R. Pratt (Chaplain to the Masonic Lodge of which Mr. MacDonald is a member), Mr. W. Scott Forbes (Mayor of Eccles), Mr. S. Glover, of St. Helens (President of the Manchester District Institution of Gas Engineers), Mr. H. Kendrick, of Stretford (a Past-President of the Institution), Mr. C. F. Broadhead (Gas Engineer to the Middleton Corporation), and Mr. A. M. Campbell (who acted as Hon. Secretary to the Subscribers' Committee).

The toast of the evening—that of "Our Guest"—was proposed by Colonel Andrew, V.D., J.P., who, on behalf of the company and many friends who could not be present, wished Mr. MacDonald a safe voyage, good luck, good health, and long life. While they all regretted the departure of their friend from the district, they felt proud that he was going out to Australia to take up such an important appointment; and it was their sincere hope that he would be successful in his new sphere of work. He (Colonel Andrew) had no doubt that Mr. MacDonald, with his business ability and other qualities, would achieve success abroad, and gather round him, as he had done in the Eccles district, a host of good friends. Mr. H. Maude, Dr. Sturrock, Mr. S. Glover, and Rev. R. Pratt supported the toast, each in the course of his remarks re-echoing, but in different phraseology, the hope expressed by Colonel Andrew that Mr. MacDonald would meet with success in his new appointment.

The Chairman then presented Mr. MacDonald with a gold watch and a "Handbook for Gas Engineers and Managers," which had been subscribed for by friends as a memento of the occasion. On behalf of the contributors, he expressed the hope that the recipient would be blest with health, happiness, prosperity, and long life to wear the watch.

Mr. MacDonald, on rising, was received with cheers. He said he could not adequately express his thanks to his friends for the honour they had done him that night, and for the handsome gifts which had been given him. It was usual, on occasions like this, for people to say it was "the proudest moment of their lives." He had not wanted to make use of the phrase, but he could not help it; for it really was the proudest moment of his life. When he looked round, and could say that he claimed as personal friends the hundred and odd who were present, he felt honoured in a way which it was impossible for him to explain.

A highly attractive musical programme had been arranged for the occasion.

**Profit-Sharing v. Co-Partnership.**—Writing upon this subject in "The Times" last Wednesday week, "A Septuagenarian" said: "It is hardly necessary to labour the argument that the non-capitalist cannot enter into true partnership with the capitalist. Partnership implies bearing of losses as well as participation in profits. The only practicable mode—and it is a good one—is for employees to become shareholders when they are working for a company under the Limited Liability Acts, with fully paid-up shares. This has been successfully done in several cases, either by purchase at current rates or sometimes under a special preferential scheme. It is not partnership in the ordinary sense of the word. A member of the board representative of the employees is, for obvious reasons, inadvisable, and, except in a very few businesses, would almost certainly make for disorganization. . . . A system of sharing in profits above a certain amount appears to be the most feasible solution of some of our industrial difficulties. It seems a fair arrangement that the employee should receive his full standard wage, the capitalist a fair return for what he invests in a commercial venture, and, after providing for management and all other charges, that the remaining profit should be divided between the two in such proportions as the peculiarities of the business may make just and equitable. The thing can be, and has been, done without difficulty by a carefully devised system of gratuities based on profits."

## ELECTRICITY FAILURE IN LIVERPOOL.

By a strange coincidence, the breakdown of the electrical plant at the Liverpool Post Office last Sunday week was followed on the Monday evening by a total failure of the Corporation electrical supply, owing to some trouble in connection with one of the high-tension mains. The defective main was cut out of service, and another utilized in its place. But this, of course, could not be done immediately; and it was necessary that the power should be worked up again gradually. The accident occurred at about 9 o'clock, and naturally caused much inconvenience. Some of the places of amusement generate their own current, and so felt no inconvenience. It was, however, different in other cases; and we learn from the "Liverpool Daily Post" that the "failure of the light proved very trying in the public hospitals. Yet there were cases which prove how resourceful the officers can be in times of emergency. While Dr. Damer Harrisson, of Rodney Street, was performing an operation in the David Lewis Northern Hospital, the lights suddenly went out. Luckily the Matron had in her room a portable lamp, which she hastened to procure; and the operation was safely finished with the Matron standing by holding the lamp. While a minor operation was being performed on an out-patient in the same hospital, an emergency light was obtained from a small gas-stove, by stopping the flow of air through the pipe, which caused a white flame."

Fortunately, as regarded public lighting, the inconvenience caused could not have been overwhelming—seeing that, from the latest available returns, it appears there are only about 6¾ miles of streets lighted by electricity, as against 465 miles by gas. Then, again, with reference to business premises, the "Liverpool Courier" last Tuesday made the following comments: "The failure of the light proved at least one thing—that the occupiers of places of business have, in many instances, learnt a lesson from the strike last August, when the curtailment of the Corporation electric supply placed them in great difficulties. Since that time it is evident that scores of them have arranged for gas, because last evening, in many of the hotels and large shops about the centre of the city, this form of illumination was at once resorted to. All who were not wise enough to secure such a second string to their bow, were compelled to fall back on candles."

## DEVELOPMENT OF THE CARDIFF WATER-WORKS.

### Paper by the Corporation Water Engineer.

The members of the Royal Sanitary Institute recently held a provincial sessional meeting at Cardiff, under the presidency of Mr. W. WHITAKER, F.R.S. The gathering was specially worthy of notice in our columns from the fact that a paper on "The Development of the Cardiff Water-Works" was read by Mr. C. H. PRIESTLEY, M.Inst.C.E., the Water Engineer to the Corporation.

After giving a few particulars in regard to the early history of Cardiff, the author stated that it was subsequent to 1840 that the town began to grow rapidly; and in 1850 the population numbered 18,000. In that year, an inquiry was held into the condition of the sewerage, drainage, and water supply of the town. The information given to the Inspector by witnesses was hardly credible in the light of present experience, when every town in the country, and most villages, have a more or less efficient water service.

The two chief supplies to the town were the public pumps. These, however, were quite insufficient to meet the moderate requirements of a family—the usual quantity allowed being apparently two pailfuls a day. But even then it was stated that in dry weather the pumps generally failed about 5 p.m. The evidence clearly proved how very inadequate was the supply of water, and how very doubtful was its purity.

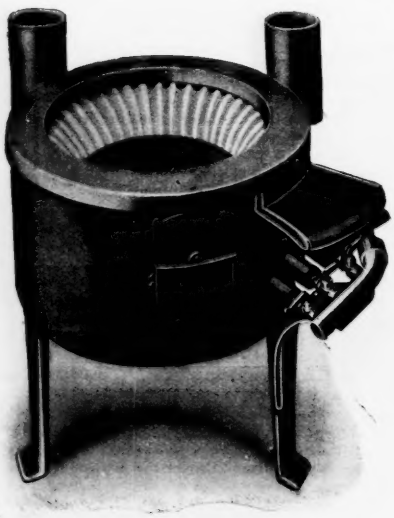
In the year 1850, a Company was formed for the purpose of supplying water to the town, port, and neighbourhood. Parliamentary powers were obtained; and the Company proceeded to put them into operation. In 1853, the Company again went to Parliament and repealed the Act of 1850, substituting that of the later year. The first works constructed by the Company were situate near the River Ely. On Jan. 12, 1852, the pumping-engine was first started at Ely, and the service began to be connected to the houses; but prejudice seems to have prevailed, and for some time only a comparatively small number were supplied.

For a considerable period after the construction of the Lisvane reservoir, it was unnecessary to pump from the River Ely. But as the population continued to increase rapidly, this source was again brought into operation; and to improve the quality of the water a collecting culvert was constructed in 1873, parallel with the river and on the north side of it. By the year 1878, the total population supplied had increased to upwards of 80,000; and there was every indication that the rapid growth which had been going on for the preceding twenty years would be maintained, if not exceeded. This proved to be the case.

By this time the Water Company were receiving a handsome revenue from their undertaking; and it became every year more imperative that, if they were to keep pace with the rapidly increasing requirements, further provision would be necessary. A Bill was accordingly promoted providing for new reservoirs and other works at Llanishen and Lisvane, together with considerable extensions at Ely.

A very important period in the development of the Cardiff water supply commenced at this time. It was far-reaching in its effects, and, to the author's mind, had much to do with the progress and prosperity of the city and of the surrounding districts which had the benefit of Cardiff water. Negotiations were entered into between the Corporation and the Water Company; and an agreement was arrived at whereby the Corporation paid £300,000 for the undertaking. The Corporation next year obtained the necessary powers for purchase; and the whole


# GAS AS FUEL.



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of the works came into their hands on Sept. 29, 1879. Following the purchase of the undertaking, the Water Committee of the Corporation seriously took into consideration what steps should be taken to improve the supply, which was inadequate to meet growing needs; and they instructed their then Engineer (Mr. J. A. B. Williams, M.Inst.C.E.) to make full inquiry as to all the available sources which would be capable of meeting the requirements of the town and neighbourhood, not only to the fullest extent for the time being, but for a greatly increased population.

Mr. Williams presented his report in June, 1881, and strongly recommended what was called the "Taff Fawr" or "Brecon Beacons" scheme. A proposal of such magnitude, which included the construction of large storage reservoirs, situated more than thirty miles from Cardiff, with the necessary trunk mains and other works, naturally gave rise to great discussion both in the Council and in the town. But, after prolonged consideration, the Council in May, 1883, finally adopted the recommendations of their Engineer.

Before the Act of Parliament was obtained for this scheme, a large reservoir was commenced at Llanishen, having a capacity of 317 million gallons, for which powers had been granted to the Water Company. This reservoir could be utilized to some extent for storing water from the existing gathering-grounds, and afterwards for the Taff Fawr water when it was received. It was completed in the autumn of 1886, and proved of inestimable value the following year, which will be remembered as the driest summer of the last half-century. Had it not been for the extra storage available, the town would have been put to the most dire straits for want of water. Even then it failed to meet the requirements of a full supply, though upwards of 200 million gallons had been added to the storage.

Mr. Priestley then gave a detailed description of the Taff Fawr works and the reservoirs, and concluded by saying that when the third reservoir in the Taff Fawr Valley was completed Cardiff would have a total storage in its reservoirs of upwards of 2200 million gallons—sufficient for a population of considerably more than 300,000 persons, allowing for a full and unrestricted use of the water. The wisdom of going so far afield as the Taff Fawr Valley for the Cardiff water supply had, he thought, been amply demonstrated, especially when he mentioned that there was a further site in the valley for another large reservoir, whenever it might become necessary, and a sufficient rainfall during the wet season to fill all the reservoirs.

**Indebtedness of Local Authorities.**—In answer to a question by Mr. Godfrey Collins, the President of the Local Government Board stated last Wednesday in the House of Commons that the total amount of the loans shown in the annual local taxation returns as having been raised by local authorities in England and Wales in the twenty years ended March 31, 1910, is £468,616,000. During the same period, local debt was repaid to the extent of £131,285,000; and a further sum of £17,042,000 was set aside, which remained in sinking funds at the end of the period.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

The coal strike is now only a memory; and reports from the different centres in Scotland show that normal conditions have been returned to, so far as gas lighting, heating, and power are concerned. There has been a big drop in coal prices; but there is no disposition to revert to the figues ruling before the strike. The indications from various quarters are that gas engineers and managers on their new contracts will probably have to pay from 6d. to 1s. more per ton for their coal.

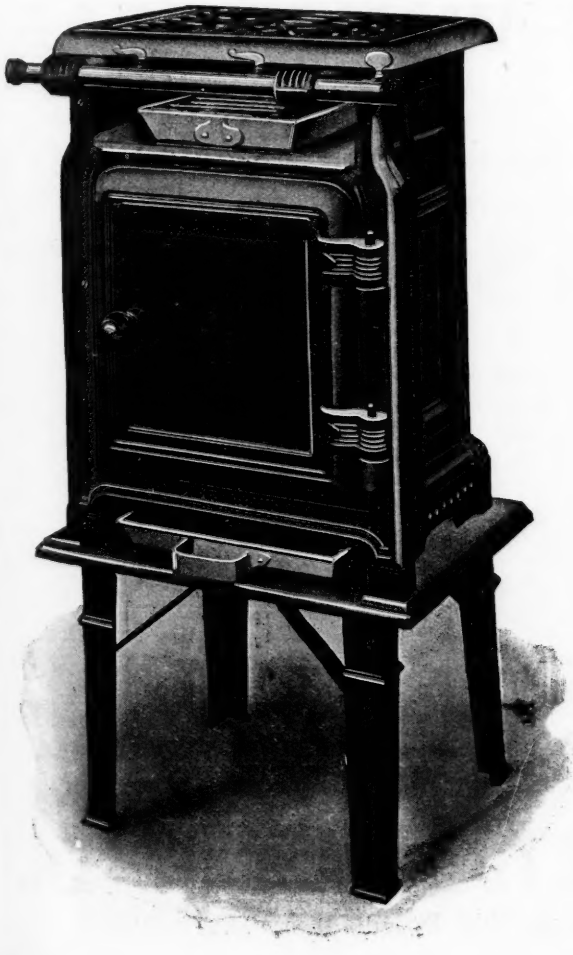
Having done so much for the advance of gas cooking, the Edinburgh and Leith Corporations' Gas Commissioners are now to show the serviceability of gas-furnaces for industrial uses. Next Thursday, in the Livingstone Hall, South Clerk Street, Edinburgh, Mr. E. P. Taudevin (of the Richmond Gas Stove and Meter Company) is to deliver a lecture, and give a practical demonstration, on gas-furnaces. Bailie Lindsay will preside.

The Edinburgh and Leith Gas Commissioners are steadily going forward in their campaign, which is being successfully carried out under the careful supervision of Mr. Masterton, the Engineer and Manager, of demonstrating the superiority of gas-cooking appliances. These are now fitted free to approved applicants; and the demand has been such that a considerable time will elapse before all the orders are overtaken. Councillor Robert A. Douglas, on Wednesday, opened a cookery demonstration and gas exhibition in the Free Gardeners Hall, Picardy Place. The exhibition remained opened until Friday. Demonstrations were given by Miss M. J. H. Adams; and the variety of dishes that were turned out "done to a turn" was a revelation to experienced housewives.

A communication by Mr. William M. Mason, the Secretary of the British Commercial Gas Association, on "Gas *versus* Electricity for Cooking Purposes" has attracted a good deal of attention. An article appeared in a Glasgow contemporary, which, among other things, said that there was more wastage in meat when cooked by gas than by electricity. Mr. Mason gave a complete refutation to the statement—using figures that have already been given in the "JOURNAL."

The advisability of including in the programme of the Glasgow Corporation Smoke Abatement Exhibition a series of gas-cookery competitions, open to schoolgirls in Glasgow, was the subject of a conference on Wednesday in the City Chambers. The outlines of the scheme were explained to the School Board representatives, who undertook to report the proposal to the Board. The exhibition is to be held during the autumn.

At Thursday's meeting of the Glasgow Corporation, Councillor Hamilton gave notice of his intention to move, at a subsequent meeting, a resolution to the effect that, in view of the great success that was achieved by the Gas Department in retailing coke in small quantities



A "Kent" or "Sussex" Cooker on stand placed in your Showroom will elicit a large number of enquiries and orders.

These compact cookers are of undoubted efficiency, while the stand makes them as convenient to work with as larger cookers of greater height.

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The original and most popular cookers of their class. Can be fitted with plate rack.

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**25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 333, Queen St., MELBOURNE; 12, Cunningham Lane, Pitt Street, SYDNEY; and 8, Exchange Place, Donegall Street, BELFAST.**

during the recent coal strike, the Gas Committee should be instructed to make the necessary arrangements so that the scheme could be improved and continued. It falls to be noted that this great success in the retailing of coke, which was of incalculable benefit to the poorer classes in the city, was very largely due to the personal efforts of Mr. Alex. Wilson.

Thirty-five £5 shares in the Alyth Gas Company were disposed of on Wednesday in the Lesser Town Hall, in lots of five. They realized from £27 10s. to £28 2s. 6d. per lot.

At a meeting of the Aberdeen Town Council on Monday, an application was read from the firemen, barrowmen, and boilermen at the gas-works asking that their wages be increased by 6d. a shift. The matter was remitted to the Gas Committee for consideration.

The Edinburgh City Police report two cases of gas poisoning. At a late hour on Thursday evening, an Edinburgh professional man was found lying apparently dead in the bathroom of his house. A friend had called during the evening; and on getting no response to his knocking, entry was made by one of the windows. The gas was found to be turned full on in the room where the occupant of the house was found. On medical aid being summoned, life was pronounced to be extinct. The second case was that of a widow woman, who was found dead, sitting on a stool in front of her kitchen fire. The gas on the mantelpiece was also turned full on. The deceased lived alone. When entry was made, it was apparent that the woman had been dead for several hours. Circumstances in the cases point to their both being accidental.

At the meeting of the Fife County Council on Wednesday, the chief business was the confirmation of the resolution regarding the promotion of a Provisional Order for the transfer to the County Council of the Wemyss water undertaking. Sir Ralph Anstruther, Bart., who presided, pointed out that the resolution required to be confirmed by an absolute majority of the County Council. Eventually the resolution to promote the Order was unanimously carried.

The new water supply for the Burgh of Invergordon was formally turned on to the town on Wednesday. The new supply is derived from Kinrive springs on the Kindeace estate. From there it is carried in cast-iron pipes to the reservoir on the Newmore estate, and thence to the town. The ceremony of turning on the water at the source was performed by Miss Joss, daughter of a former Chief Magistrate. At the King Edward fountain in the burgh, the water was turned on by Miss M'Donald, daughter of Provost M'Donald. Success to the new undertaking was drunk at a cake-and-wine banquet in the Town Hall.

**Reduction in Price at Macclesfield.**—The highest profits ever recorded at Macclesfield were announced at a meeting of the Gas Committee of the Corporation last Wednesday, when it was stated that the amount was £8721, the whole of which (except £1000 added to the maintenance fund) would go in relief of the rates. The Committee have decided to make an all-round reduction in the price of gas of 3d. per 1000 cubic feet. The previous price for domestic use was 2s. 6d.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 20.

**Sulphate of Ammonia.**

There is still no element of weakness in the situation of this article, but transactions for near delivery continue to be limited by the reduced supplies. Coke-ovens have by no means got fully going again, and the gas-works output has met with ready demand at full prices. Home consumption has fallen away to some extent, but there have evidently been considerable requirements for the filling of export contracts. The closing quotations are £15 per ton f.o.b. Hull, £15 1s. 3d. per ton f.o.b. Liverpool, and £15 2s. 6d. per ton f.o.b. Leith. In the forward position, there has been more inquiry, and it has been recorded that a substantial business has been done during the past week at the equivalent of £14 10s. per ton at the ports for delivery both the second half of this year and the first half of 1913.

**Nitrate of Soda.**

The tone of this market is again rather firm, and holders are now asking 11s. 1½d. per cwt. for 95 per cent. quality, and 11s. 3d. for refined quality, on spot.

LONDON, *April* 22.

**Tar Products.**

The markets for tar products remain firm, and there has been a little more business doing during the past week. The inquiry for pitch for both prompt and forward delivery is good, and business has been done at improved prices. Benzols are firm, though there is very little business doing in either grade. In heavy and solvent naphtha, the demand is decidedly good.

The average values during the week were: Tar, 27s. to 31s. *ex* works. Pitch, London, 51s. to 51s. 6d.; east coast, 50s. 6d. to 51s. 6d.; west coast, Clyde 49s. 6d. to 50s., Manchester 49s. to 50s., Liverpool 50s. to 51s. Benzol, 90 per cent., naked, London, 11d. to 11¼d.; North, 10⅞d. to 11d.; 50-90 per cent., naked, London, 10d.; North, 9½d. Toluol, naked, London, 10d. to 10½d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4½d. to 5d.; North, 3⅞d. to 4½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d. f.o.b.; North, 10⅞d. to 11d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 2⅝d. to 3⅛d.; North, 2¼d. to 2⅝d. salty, 2⅜d. to 2¾d. liquid. Heavy oils, in bulk, 3¼d. to 3⅝d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 6d. to 2s. 7d. Naphthalene, £4 10s. to £8 10s.; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

**Sulphate of Ammonia.**

This market is decidedly steady; and manufacturers are firm in their ideas of value for both prompt and forward delivery. Actual Beckton is quoted £14 5s. to £14 6s. 3d. Outside London makes are £14 to £14 2s. 6d.; Hull, £14 17s. 6d. to £14 18s. 9d.; Liverpool, £14 18s. 9d. to £15; Leith, £15 to £15 2s. 6d.; Middlesbrough, £15.


# COAL STRIKE *VERSUS* WATER GAS PLANTS.

Have you considered the advantages of a

# WATER GAS PLANT

for your own Works as adopted at

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| CLEETHORPES GAS-WORKS | .. | Oil or Benzol Carburetting. | |
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| NEWTON ABBOT | ,, .. | Oil | ,, |
| NEW MILLS | ,, .. | ,, | ,, |
| PRESCOT | ,, .. | Tar | ,, |
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**Plants made from 50,000 cubic feet per day upwards and to suit local conditions.**

**Prices and Particulars from—**

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**London Office: 165, Gresham House, Old Broad Street, E.C.**

## COAL TRADE REPORTS.

**Northern Coal Trade.**

There is now a larger, but still not an adequate, supply of coal. The prices consequently continue high, though they are decreasing. In the steam coal trade, the inquiry is keen; and for best Northumbrians, from 17s. per ton f.o.b. is quoted, with 16s. for seconds, and 10s. 6d. to 11s. for smalls. The steam coal collieries appear to be working well; and the prices have eased a little. In the gas coal trade, the demand is strong both for home use and for export; and as so much of the output is taken up by the running contracts, prices are high for any quantities that are wanted beyond these. Best Durham gas coals are about 16s. per ton f.o.b.; and for second-class coals, about 15s. 6d. is the current price. For "Wear" specials, from 17s. per ton is quoted. The tenders for gas coals for the South Metropolitan needs to the end of June are now allotted, at prices that are said to vary from 15s. 6d. to 16s. 6d. per ton f.o.b., according to the quality. There is now a demand for gas coal for early export, as the current rates of freight are now very low, steamers being detained during the strike; and it is thought that these rates may be advanced. The output of the gas coal collieries is steadily increasing; but it will be some time before the stocks generally are refilled. Coke is high in price. Good gas coke is about 17s. 6d. per ton f.o.b.

**Scotch Coal Trade.**

The coal trade throughout Scotland is rapidly assuming a more normal character. The selling prices are now more readily obtained, and may be regarded as being more approximately accurate. Coal of all kinds is in demand; and on Friday in Glasgow the quotations were: Steam coal, 15s. 6d. to 16s. 6d. per ton f.o.b.; splint, 15s. to 17s. 6d.; ell, 15s. 6d. to 16s. 6d.; trebles, 15s. to 15s. 6d.; doubles, 14s. to 14s. 6d.; and singles, 12s. to 12s. 6d. At Methil and Burntisland, dross was quoted 8s. to 9s. f.o.b.

**Failure of the Gas Supply at Luddenden Foot.**—It is reported that the gas supply "unexpectedly gave out" at Luddenden Foot, at about a quarter past ten in the evening of last Saturday week. As a result, many shops that were still open had to be closed up immediately; and some of the publicans shut up their premises earlier than usual.

**Birkenhead Gas-Works Extensions.**—The extensions at the new gasholder station of the Birkenhead Corporation gas-works, which include the construction of a four-lift gasholder and tank, are to be commenced at an early date. The contract for preparing the ground, laying the foundations, &c., has been let to Messrs. Aird and Co.; Messrs. C. & W. Walker have obtained the contract for the ironwork; and Messrs. Allen and Co., of Birkenhead, will build the boundary walls, boiler-house, and cottages, which form part of the scheme, the total expenditure upon which will be £32,253.

**City of Santos Improvements Company, Limited.**—In the report of this Company, who own the gas, electric light, and water works in Santos, for the year ended the 31st of December last, it is stated that the profit was £64,635, which, added to £4745 brought forward, made a total of £69,380. After providing for the debenture interest (£22,620), paying the dividend on the preference shares (£12,000), an interim dividend of 3 per cent. on the ordinary shares, free of tax (£9000), and the interest on the ordinary shares of the 1911 issue (£4698), there is a disposable balance of £21,062. After placing £4000 to the reserve and £2000 to the tramways renewal account, the Directors recommend the payment of a final dividend of 4 per cent. on the ordinary share capital other than that issued last year. This will absorb £12,000, making 7 per cent. (free of tax) for the year, and leave £3062 to be carried forward. The total number of public gas-lamps at the end of the year was 1368 ordinary and 54 high power; being a small increase as compared with 1910. The number of consumers was 2637, or 82 more than before. The number of houses taking water was 5505—an increase of 145. The number of electric street lamps at the end of the year was 594, and of private consumers 895—increases respectively of 23 and 376.

**Tavistock and its Water-Works.**—At a meeting of the Tavistock District Council last Thursday, the Chairman (Mr. R. J. Doble) explained at length the negotiations which have taken place with the Duke of Bedford with reference to the purchase of the water-works and market, for which purpose the Council are promoting a Bill this session. In the early stages of the negotiations, it was hoped that matters would be pushed on so that the arbitration might take place before the Bill came before Parliament. This, however, could not be arranged; and subsequently the Council were informed that unless they agreed to purchase on the terms laid down in a draft agreement submitted by the Duke's advisers, everything possible would be done to oppose the Bill. Clause 15 of the agreement provided that the arbitrator was to take no account of the fact that the Duke had no statutory power to provide water, which meant an increase of six years' purchase-money to be paid by the Council. It also specified that the price to be paid for the water was to be based on the income that might be derived in future. Both these conditions the Council considered unreasonable. Ultimately an interview was had with the Duke's Solicitor, who agreed to withdraw clause 15, and that there should be an open arbitration; that no directions should be given to the arbitrator by either side; and that both parties should be at liberty to lay before him any arguments they chose. It had also been agreed that the arbitrator should be a lawyer, instead of a member of the Surveyors' Institution, as was originally proposed. This was also an important concession, as it was considered that a surveyor would be more likely than a lawyer to give special attention to structural value. As matters now stood, he believed they would get a price fixed which would be favourable to the ratepayers. It was decided to affix the seal of the Council to the agreement as amended.


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## In the CALEFACTOR,

the Pre-heater is never, under any conditions, a Pre-cooler. It is an effective Pre-heater, not some of the time, but all the time.

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**Essex Works,**
**BIRMINGHAM.**

***Test the Calefactor.***

31A.

**Gas-Works Profits at Stalybridge.**—The minutes of the Gas Committee of the Stalybridge Corporation, approved at a meeting of the Council last week, contained a resolution that "the sum of £2020 be carried from the gas-works revenue account to the credit of the borough rate." It was explained by the Mayor (Alderman J. Ridyard) that the profit on the gas undertaking was about £1400, and the subsidy agreed upon was £2020. The Gas Committee, having some profits in hand, had been able to pass £2020 in relief of the rates; but the Committee felt that, under existing circumstances, they could not promise such a sum for next year, because they had now only a few hundred pounds to the credit of the revenue account. As a matter of fact, they did not think they could provide more than £1500.

**Harsh Treatment of the Tarapaca Water Company.**—At the recent meeting of this Company, the Chairman (Sir Robert Harvey) said he had again to inform the shareholders of the Company's harassed position through the tenacious opposition and unreasonable attitude of the Iquique Municipality. For twelve years the Company had been in litigation with the Municipality, endeavouring to recover payment for their consumption of water in the public gardens, schools, markets, slaughter-houses, and municipal offices. Their latest arbitrary act was the attempted imposition on the Company of fines for what they called a contravention of their resolution in 1908 officially reducing, or assuming to reduce, the price of water. He further pointed out that the Company were also in an uncomfortable position through the action of the Supreme Government, which had decreed the sale of a tract of nitrate grounds near Iquique, from the proceeds of which they had allocated the sum of £280,000 for the installation of a supply of cheap and abundant potable water to Iquique. As no interest on the Government capital would be expected, the sales of water would be at such a price as to quite preclude the Company trading at a profit.

**Smethwick Gas Supply during the Coal Strike.**—At the meeting of the Smethwick Traders' Association last Tuesday, the members expressed their cordial appreciation of the way in which the Corporation Gas Department had maintained the supply of gas during the recent crisis. Mr. C. H. Rayner proposed a resolution conveying the satisfaction of the Association with the members of the Gas Committee, the Manager and Engineer (Mr. Vincent Hughes), the Secretary (Mr. W. J. Sturges), all the officials, and the Town Council, for the excellent way in which they had conducted the gas undertaking during the past few eventful weeks. Mr. Rayner said this was an occasion for very hearty congratulations. As traders, they had cause for appreciation that the gas service had been so well maintained. Smethwick stood out as one of the few towns that had been able to withstand the great strain of the coal strike. It greatly redounded to the credit of all concerned; and the traders of the town appreciated the foresight which had been displayed. Mr. Jasper said every gas consumer in the borough had cause for the liveliest satisfaction. The resolution was carried with acclamation, and the Secretary was requested to communicate the Association's views to the Town Clerk, with a view to the resolution coming before the Council.

**Increased Pay for Gas Workers at Bury.**—The Gas Committee of the Bury Corporation have decided to recommend the Council to grant an increase in pay of 3d. per day to stokers, firemen, coal and coke elevator men, engine and boiler hands, and workers engaged on the sulphate plant.

**Effects of the Coal Strike.**—The effect of the coal strike on the labour market is forcibly shown in the reports of Trade Unions to the Board of Trade; 392 Unions, with a net membership of 675,535, having had 76,144 unemployed at the end of March. This was 11·3 per cent. of the members, as compared with 2·8 per cent. at the end of February and 3 per cent. in March, 1911.

**Doncaster Corporation Gas Undertaking.**—Interesting figures are given in a return for the past year just issued by the Gas Committee of the Doncaster Corporation. They show the position of the gas undertaking to be very satisfactory. There was an increase of £2457 in the revenue from the sale of gas, &c., and a decrease of £3225 in the cost of its manufacture. The sale of residual products yielded £1184 less; but on the expenditure side there were economies under this head amounting to £435. The total income was £1411 greater than in 1910-11, and the total expenditure only £901 higher. This is all the more satisfactory when it is remembered that the expenditure included a special item of £1400 for the demolition of old retort-settings. The profit on the year's working was £5000.

**Littleborough Gas Company Complimented.**—In the course of a speech by the Chairman of the Littleborough Urban District Council (Mr. Lees) last Wednesday, he said he thought that the Council should compliment the Littleborough Gas Company on the way in which they had served the inhabitants of the district with coke during the recent trying time, and also for keeping the price at so low a figure. It had been an immense advantage to both the lower and middle classes; and the district owed the Company a debt of gratitude for the way in which they had handled their works and supplied coke during the crisis. Referring to the position of Littleborough during the coal strike, the "Rochdale Observer" last Saturday said: "It is interesting to note that during the period of the strike no coal was received at the gas-works. There has been no restriction or curtailment of the gas supply to private consumers, and the public lamps have been lit as usual. A large number of local firms are dependent on gas for power and manufacturing purposes, and, consequently, the regularity of the supply has an important bearing on industry and employment."

---

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3¼ per cent., free of income-tax, on account of the year ending the 30th of June next. It will be at the same rate as last year.

Messrs. Balcke and Co., Limited, of Broadway Court, Broadway, Westminster, have sent us a pamphlet containing particulars and illustrations of their "Unic" steam-traps which can be used for high, medium, or low pressure steam.


"MAUGHAN" GEYSERS

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WATER HEATERS

The Modern Water Heating Appliances for all Requirements.

THE PARKINSON STOVE CO., LTD.

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IMPORTANT IMPROVEMENT.

GEYSERS with DETACHABLE INTERIOR

enabling repairs to be effected at a very small cost, without removal.

This means

REDUCED MAINTENANCE COST.

Full particulars will be found in our

WATER HEATER SECTION CATALOGUE

No. 100.

May we send you one?

The Accrington and District Gas and Water Board have advanced the wages of carters in their employ from 24s. to 25s. per week.

We learn that Mr. J. D. Allan, lately senior representative in Scotland for Messrs. James Keith and Blackman Company, Limited, has joined the staff of Messrs. James Milne and Son, Limited, of Edinburgh, as engineering representative for their gas-meter and plant departments.

The authorities of the Royal Infirmary, Preston, have placed with Messrs. John Wright and Co. a large order for special gas and steam heated appliances, which they have fitted throughout the Infirmary kitchens—replacing the solid fuel and old-type gas apparatus previously used.

The tenders recently invited in our advertisement columns for an issue of 7 per cent. "B" (£10) shares in the Bournemouth Gas and Water Company amounted to £16,885 8s. 6d., and ranged from £15 17s. 6d., to £17 10s. 6d. per share. The average price obtained for the issue was £16 1s. 8d. per share.

In the "JOURNAL" for the 2nd inst., it was announced that Mr. William Richards (Messrs. A. & W. Richards) would offer for sale, under an order of Mr. Justice Eve, the works and undertaking of the Mid-Essex Water Company, Limited. Offers were invited by him at the Mart, Tokenhouse Yard, E.C., last Tuesday; but no bid reached the reserve price fixed by the Court.

In view of the approach of summer, the Davis Gas-Stove Company, Limited, have issued an attractive booklet, bearing the title of "Summer Comfort," giving particulars and illustrations of their stoves and other appliances, preceded by a few hints to ladies as to how to do their culinary work in half the usual time, with economy of labour and money, and with relief from kitchen drudgery. They put before them cooking by gas as "a big luxury at a small price."

One of the 42-inch pipes on the Lake Vyrnwy water supply system burst in the early morning hours last Sunday week, at a point near some construction works now in progress at Malpas. Automatic apparatus installed gave the Resident Engineer warning that something was wrong, and the valves were quickly brought into action to restrain the flood of water. Owing to the prompt action taken, and the position of the burst, a comparatively small amount of damage was done; but the Chester road was flooded, and rendered for a time impassable.

Messrs. Joseph Taylor and Co. have recently received orders for saturators of their make, including the whole of the leadwork, for the sulphate plants now being erected for the Harpenden District Gas Company and the Ryde Gas Company; likewise for their make of saturator, from Messrs. James Gibbs and Finch, Limited, the Guildford Gas Company, and two repeat orders from Messrs. John Terry and Co. for Melbourne; also for a saturator designed either for hand fishing or steam ejecting, weighing 8½ tons, for the Rochdale Corporation Gas Department, and a similar one for Messrs. Thomas Ness, Limited, of Darlington.

Reference has been made on several occasions in the "JOURNAL" to the oil-gas producing plants of Messrs. Mansfield and Sons, Limited, of Hamilton Square, Birkenhead. They have just issued a new list of these plants suitable for villages and small towns, and capable of producing gas for lighting, cooking, heating, and power purposes. The illustrations of the plant are exceedingly well done, and the particulars accompanying them are concise and to the purpose. Messrs. Mansfield offer their system as a practical solution of the question of a gas supply for isolated districts in all parts of the world at a small capital outlay. The gas is made from any kind of oil, and they claim that it is permanent and has a high illuminating power. The gas can be used with all the lighting, cooking, and heating appliances now employed, as well as with ordinary gas-engines.

## GAS COMPANIES' STOCK AND SHARE LIST.

Every factor operating on the Stock Exchange last week was antagonistic to progress in the general improvement of business to which all were fondly looking forward. First came the tragedy of the "Titanic"—a catastrophe too awful in its immensity for the mind to grasp. Next there was the apprehension caused by the spread of the seat of the Turko-Italian war to the vicinity of Constantinople. Other disturbing elements were furnished by the loss of traffic to railways through the strike, and the approaching issue of an Indian loan unwelcomed by Consols. It was surprising that markets resisted so well all these forces of abatement calculated to depress prices. The opening was rather good. Government issues profited by cheaper money to score some modest advances; Railways were keenly alive, and dealings at rising figures were brisk; the Foreign Market was smooth and firm; and only Americans weakened. On Tuesday, business was set back by the announcement of the horror at sea; and a heavy tone prevailed, which was only partially lightened in the afternoon. On Wednesday, the earlier hours were depressed, and again an improvement gained ground later. Consols managed to advance ⅛. Rails were, however, dejected by traffic returns; and Americans were lower. Thursday was brighter (though Consols lost their ⅛ advance) and more active. There was a distinctly better tone in Railways. Americans also rose; but they closed below the best. Friday was depressed by affairs in the Near East. Government issues weakened, but recovered later; and Railways were quite flat, with lower prices all round. The Foreign Market was dull; and Americans still went down. The general tendency was much the same on Saturday; but business was very quiet, and movements were restricted accordingly. Consols closed unchanged at 77⅞-78⅛. The Money Market was quieter, and rates moved in the direction of greater ease. Business in the Gas Market was well up to the mark in point of activity; and the volume of transactions was fairly evenly distributed among undertakings belonging to every group. The general tendency was quite good, though actual advances in quotations were only moderate in number and in extent. In Gaslight and Coke issues, the ordinary was brisk and firm, changing hands at 103 to 103¾—a rise of ¼. In the secured issues, the maximum realized from 84½ to 86, the preference from 102¾ to 103½, and the debenture from 79 to 79¾. South Metropolitan was still on the rise, prices advancing from 116¾ to 118½—a rise of 1. The debenture marked 79 and 80. In Commercials, the 4 per cent. made 109¾, and the 3½ per cent. 105. Among the Suburban and Provincial group, Alliance and Dublin was done at 78¼ to 79½, British from 45 to 45⅝, Ilford debenture at 93, Lea Bridge at 126¾, and (on the local Exchange) Newcastle at 100. In the Continental companies, Imperial changed hands at 191 to 192, ditto debenture at 89¼ and 90, Union at 82½ special and 84, ditto preference at 137 and 137½, and European at 20 to 20½. Among the undertakings of the remoter world, Bombay marked 6 3/16 (a rise of ⅛), Cape Town 2, ditto debenture 79 and 79½, Monte Video 12¼ and 12½, Primitiva from 7⅝ to 7 13/32, ditto preference from 5 5/16 to 5 7/16, River Plate debenture 95½, San Paulo 11¾ and 11⅝, and ditto preference 11¾—a rise of ¼.

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 1,551,868 | Stk. | Apl. 12 | 5 | Alliance & Dublin Ord. | 77—80* | .. | 6 5 0 |
| 374,000 | Stk. | Jan. 12 | 4 | Do. 4 p.c. Deb. | 91—93 | .. | 4 6 0 |
| 250,000 | 5 | Apl. 12 | 7½ | Bombay, Ltd. | 6—6½ | +⅛ | 5 15 5 |
| 50,000 | 10 | Feb. 29 | 15 | Bourne- 10 p.c. | 28½—29½ | .. | 5 1 8 |
| 332,000 | 10 | " | 7 | mouth Gas B 7 p.c. | 16—16½ | .. | 4 4 10 |
| 75,000 | 10 | " | 6 | and Water Pref. 6 p.c. | 14—14½ | .. | 4 2 9 |
| 380,000 | Stk. | " | 13 | Brentford Consolidated | 258—263 | .. | 4 18 10 |
| 330,000 | " | " | 10 | Do. New | 195—200 | .. | 5 0 0 |
| 50,000 | " | " | 5 | Do. 5 p.c. Pref. | 118—120 | .. | 4 3 4 |
| 206,250 | " | Dec. 14 | 4 | Do. 4 p.c. Deb. | 97—99 | .. | 4 0 10 |
| 219,055 | Stk. | Feb. 29 | 11 | Brighton & Hove Orig. | 215—220 | .. | 5 0 0 |
| 244,200 | " | " | 8 | Do. A Ord. Stk. | 156—159 | .. | 5 0 8 |
| 490,000 | 20 | Mar. 28 | 12½ | British | 45—46 | .. | 5 8 8 |
| 120,000 | Stk. | Dec. 29 | 4 | Do. 4 p.c. Deb. Stk. | 93—95 | .. | 4 4 3 |
| 109,000 | " | Feb. 15 | 6 | Bromley, A 5 p.c. | 128—133 | .. | 4 10 3 |
| 165,700 | " | " | 4½ | Do. B 3½ p.c. | 98—101 | .. | 4 9 1 |
| 82,278 | " | " | 5⅛ | Do. C 5 p.c. | 117—120 | .. | 4 11 8 |
| 55,000 | " | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 80—82 | .. | 4 5 4 |
| 250,000 | Stk. | " | 4 | Buenos Ayres 4 p.c. Deb. | 95—97 | .. | 4 2 6 |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 2—3 | .. | — |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4—5 | .. | — |
| 100,000 | Stk. | Dec. 29 | 4½ | Do. 4½ p.c. Deb. Stk. | 76—80 | .. | 5 12 6 |
| 157,150 | Stk. | Feb. 15 | 5 | Chester 5 p.c. Ord. | 110—112 | .. | 4 9 3 |
| 1,513,280 | Stk. | Feb. 29 | 5/9/4 | Commercial 4 p.c. Stk. | 108—110 | .. | 4 19 4 |
| 560,000 | " | " | 5⅓ | Do. 3½ p.c. do. | 103—105 | .. | 5 1 6 |
| 475,000 | " | Dec. 14 | 3 | Do. 3 p.c. Deb. Stk. | 75—77 | .. | 3 17 11 |
| 800,000 | Stk. | " | 4 | Continental Union, Ltd. | 82—85 | .. | 4 14 2 |
| 200,000 | " | " | 7 | Do. 7 p.c. Pref. | 136—138 | .. | 5 1 5 |
| 492,270 | Stk. | — | 5½ | Derby Con. Stk. | 122—124 | .. | 4 8 9 |
| 55,000 | " | — | 4 | Do. Deb. Stk. | 104—105 | .. | 3 16 2 |
| 840,150 | 10 | Jan. 31 | 10 | European, Ltd. | 20—21 | .. | 4 15 3 |
| 16,160,600 | Stk. | Feb. 15 | 4/14/8 | Gas- 4 p.c. Ord. | 103—104 | +½ | 4 11 0 |
| 2,600,000 | " | " | 3½ | light 3½ p.c. max. | 84—86 | .. | 4 1 5 |
| 4,062,235 | " | " | 4 | and 4 p.c. Con. Pref. | 102—104 | .. | 3 16 11 |
| 4,531,705 | " | Dec. 14 | 3 | Coke 3 p.c. Con. Deb. | 78—80 | .. | 3 15 0 |
| 258,740 | Stk. | Mar. 14 | 5 | Hastings & St. L. 3½ p.c. | 93—95 | .. | 5 5 3 |
| 82,500 | " | " | 6½ | Do. do. 5 p.c. | — | .. | — |
| 70,000 | 10 | Oct. 12 | 11 | Hongkong & China, Ltd. | 17—17½ | .. | 6 5 9 |
| 131,000 | Stk. | Mar. 14 | 7½ | Ilford A and C | 152—154 | .. | 4 17 5 |
| 65,780 | " | " | 6 | Do. B | 123—125 | .. | 4 16 0 |
| 65,500 | " | Dec. 29 | 4 | Do. 4 p.c. Deb. | 92—94 | .. | 4 5 1 |
| 4,940,000 | Stk. | Nov. 10 | 9 | Imperial Continental | 190—193 | .. | 4 13 3 |
| 1,235,000 | Stk. | Feb. 15 | 3½ | Do. 3½ p.c. Deb. Red. | 88—90 | .. | 3 17 9 |

| Issue. | Share. | When Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 200,242 | Stk. | Mar. 14 | 6 | Lea Bridge Ord. 5 p.c. | 125—129 | .. | 4 13 0 |
| 561,000 | Stk. | Feb. 29 | 10 | Liverpool United A. | 220—222 | .. | 4 10 1 |
| 718,100 | " | " | 7 | Do. B. | 159½—161½ | .. | 4 6 8 |
| 306,083 | " | Dec. 29 | 4 | Do. Deb. Stk. | 100—102 | .. | 3 18 5 |
| 75,000 | 5 | Dec. 14 | 6 | Malta & Mediterranean | 4⅜—5 | .. | 6 0 0 |
| 560,000 | 100 | Apl. 1 | 5 | Met. of 5 p.c. Deb. | 100—102 | .. | 4 18 0 |
| 250,000 | 100 | " | 4½ | Melbourne 4½ p.c. Deb. | 100—102 | .. | 4 8 3 |
| 541,920 | 20 | Nov. 10 | 3½ | Monte Video, Ltd. | 12—12½ | .. | 5 12 0 |
| 1,775,892 | Stk. | Feb. 15 | 4⅝ | Newc'tle&G'tesh'd Con. | 99—101 | .. | 4 6 8 |
| 529,705 | Stk. | Dec. 29 | 3½ | Do. 3½ p.c. Deb. | 86—88 | .. | 3 19 7 |
| 55,940 | 10 | Feb. 29 | 7/7/0 | North Middlesex 7 p.c. | 14—15 | .. | 4 18 0 |
| 300,000 | Stk. | Dec. 14 | 8 | Oriental, Ltd. | 137—139 | .. | 5 15 1 |
| 60,000 | 5 | Mar. 14 | 8 | Ottoman, Ltd. | 7—7½ | .. | 5 6 8 |
| 31,800 | 53 | Feb. 29 | 13 | Portsea Island A | 137—140 | .. | 4 18 4 |
| 60,000 | 50 | " | 13 | Do. B | 130—133 | .. | 4 17 9 |
| 100,000 | 50 | " | 12 | Do. C | 127—130 | .. | 4 12 4 |
| 398,490 | 5 | Oct. 12 | 8 | Primitiva Ord. | 7⅛—7¼ | .. | 5 2 5 |
| 796,980 | 5 | Dec. 29 | 5 | Do. 5 p.c. Pref. | 5⅛—5⅜ | .. | 4 10 11 |
| 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 97—99 | .. | 4 0 10 |
| 312,650 | Stk. | Dec. 29 | 4 | River Plate 4 p.c. Deb. | 95—97 | .. | 4 2 6 |
| 250,000 | 5 | Apl. 12 | 12 | San Paulo, Ltd. | 11⅛—11⅜* | .. | 5 2 2 |
| 115,000 | 10 | " | 6 | Do. 6 p.c. Pref. | 11½—12* | +¼ | 5 0 0 |
| 125,000 | 50 | Jan. 2 | 5 | Do. 5 p.c. Deb. | 50—51 | .. | 4 18 0 |
| 135,000 | Stk. | Mar. 14 | 10 | Sheffield A | 235—237 | .. | 4 4 5 |
| 209,984 | " | " | 10 | Do. B | 234—236 | .. | 4 4 9 |
| 523,500 | " | " | 10 | Do. C | 234—235 | .. | 4 4 5 |
| 90,000 | 10 | Sept. 28 | 6 | South African | 8—9 | .. | 6 13 4 |
| 6,429,895 | Stk. | Feb. 15 | 5/9/4 | South Met., 4 p.c. Ord. | 117—119 | +1 | 4 11 9 |
| 1,895,445 | " | Jan. 12 | 3 | Do. 3 p.c. Deb. | 78—80 | .. | 3 15 0 |
| 209,820 | Stk. | Feb. 29 | 8½ | South Shields Con. Stk. | 156—158 | .. | 5 7 7 |
| 605,000 | Stk. | Feb. 15 | 5/16/8 | S'th Suburb'n Ord. 5 p.c. | 122—124 | +1 | 4 14 0 |
| 60,000 | " | " | 5 | Do. 5 p.c. Pref. | 117—120 | .. | 4 3 4 |
| 117,058 | " | Jan. 12 | 5 | Do. 5 p.c. Deb. Stk. | 119—121 | .. | 4 2 8 |
| 502,310 | Stk. | Nov. 10 | 5 | Southampton Ord. | 107—109 | .. | 4 11 9 |
| 120,000 | Stk. | Feb. 15 | 7½ | Tottenham A 5 p.c. | 144—147 | .. | 4 17 0 |
| 483,940 | " | " | 5⅝ | and B 3½ p.c. | 114—116 | .. | 4 17 0 |
| 149,470 | " | Dec. 29 | 4 | Edmonton 4 p.c. Deb. | 95—97 | .. | 4 2 6 |
| 182,380 | 10 | " | 5 | Tuscan, Ltd. | 8⅜—8⅞ | .. | 5 12 8 |
| 149,900 | 10 | Jan. 2 | 5 | Do. 5 p.c. Deb. Red. | 99—101 | .. | 4 19 0 |
| 236,476 | Stk. | Feb. 29 | 5 | Tynemouth, 5 p.c. max. | 112—114 | .. | 4 7 9 |
| 255,636 | Stk. | " | 6⅝ | Wands- B 3½ p.c. | 141—144 | .. | 4 15 6 |
| 85,766 | " | Dec. 29 | 3 | worth 3 p.c. Deb. Stk. | 71½—73½ | .. | 4 1 8 |

Prices marked * are "Ex. div."

Messrs. Curtis's and Harvey, Limited, the makers of the "Ironclad" mantles, have removed from No. 3, Gracechurch Street, to Cannon Street House, E.C.

It was stated at a meeting of the Rochdale Water Committee last Wednesday, that the deficiency to be made up from the rates for the year was £4298, or £2320 more than a year ago. The largely increased deficiency is chiefly due to the drought of last summer, when £1007 was spent in removing silt from the beds of the almost empty reservoirs.

The Southport Town Council, at last week's meeting, approved of the recommendation of a Special Committee that the minimum wage for Corporation employees be 26s. per week.

At a recent meeting of the Gas Committee of the Doncaster Corporation, a resolution was passed and ordered to be entered upon the minutes thanking the Gas Engineer (Mr. Robert Watson) for the work he had done during the coal strike, and for the excellent arrangements he made for tiding over a period of exceptional difficulty.

## WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Appointments, &c., Vacant.

LADY DEMONSTRATOR. No. 5555.
DRAUGHTSMAN. No. 5553.
DRAUGHTSMAN. No. 5554.
INSPECTOR. Mitcham and Wimbledon Gas Company.
FOREMAN (METER WORKS). No. 5556.
FITTINGS INSPECTOR. Sheffield Water Department.
JUNIOR CLERK. Sheppy Gas Company.
SHOW-ROOM ATTENDANT. John Wright and Co., Birmingham.

### Agents (Export) Wanted.

LIGHTING APPLIANCES. P.O.O., care of Nygh and Van Dimar's Advertising Agency, Rotterdam.

### Appointments, &c., Wanted.

SECRETARY. No. 5548.
CLERK. Box 8, 33A, Farringdon Street, E.C.

### Plant, &c. (Second-Hand), Wanted.

WASHER-SCRUBBER. Stanley Gas Company.

### Water-Works for Sale.

EAST COAST WATER COMPANY. By Auction, Mart, E.C., May 8. 2 30 o'clock.

### Patent Licences, &c.

ACETYLENE GENERATORS. F. W. Golby, 36, Chancery Lane, E.C.
GAS CONTROLLER. Abel and Imray, Birkbeck Chambers, E.C.
IMPROVEMENTS IN GAS-ENGINES. Haseltine, Lake, and Co., Southampton Buildings, Chancery Lane, W.C.

### TENDERS FOR

**Gasholder and Steel Tank.**
DROGHEDA GAS DEPARTMENT. Tenders by May 2.

**Pipes, &c.**
MOSSLEY GAS DEPARTMENT. Tenders by April 26.

**Retort Bench Extensions.**
LIMERICK GAS UNDERTAKING. Tenders by April 29.

**Tar and Liquor.**
ABERCARN GAS DEPARTMENT. Tenders by April 30.

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*No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.*

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**Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.**

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See Illustrated Advertisement, April 2, p. 7.

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